PCWorld

AUGUST 2024

CAN QUALCOMM MUSCLE INTEL OUT OF LAPTOPS?

SNAPDRAGON X, THOROUGHLY TESTED

INSIDE

7 WARNING SIGNS YOUR **PC HAS BEEN HACKED**

MICROSOFT SURFACE PRO & SURFACE LAPTOP 7

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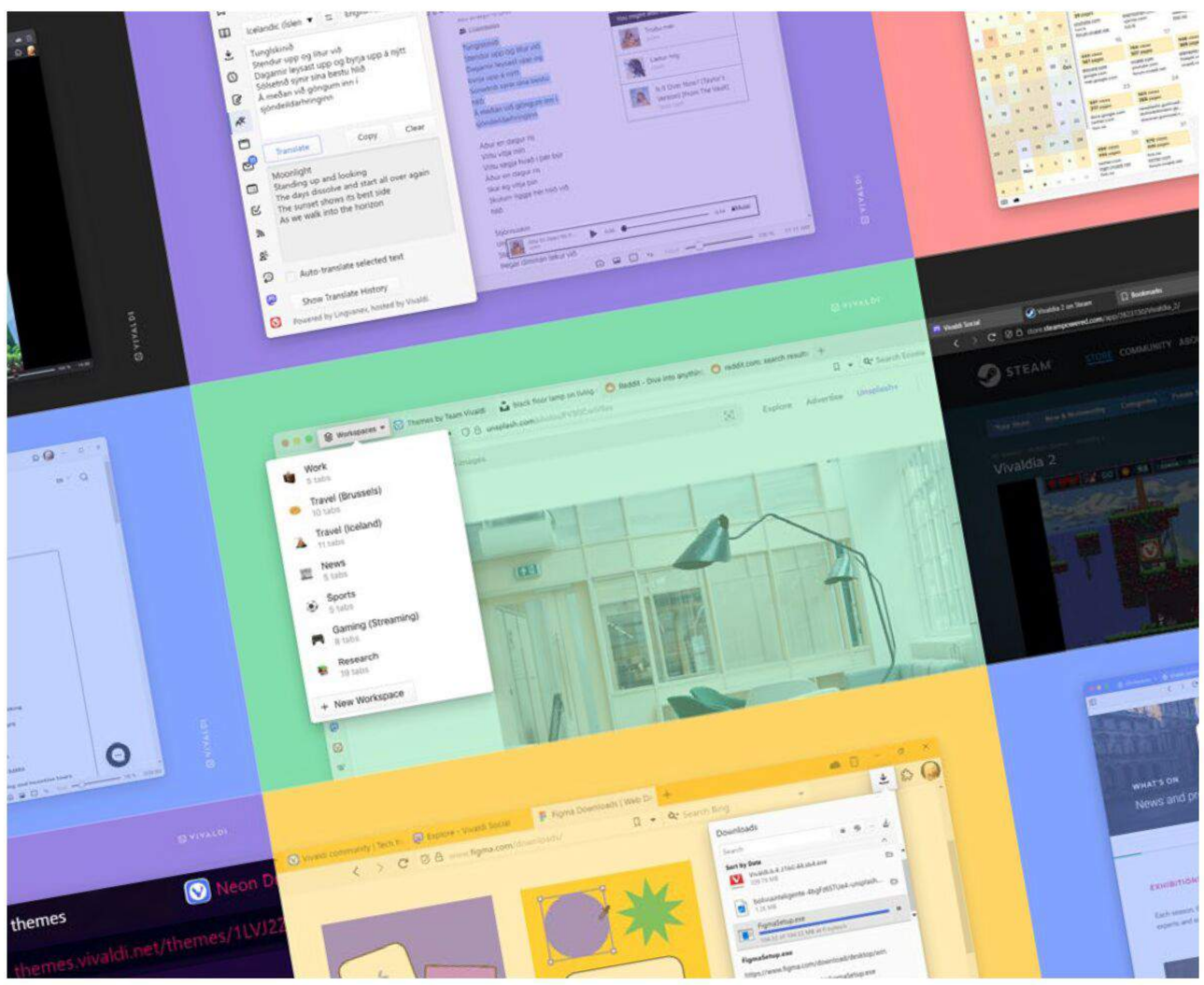

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COVER IMAGE COURTESY OF QUALCOMM

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CHECK IN ON YOUR FRIENDS

EVEN THE "STRONG" ONES

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Learn how to reach out to a friend about their mental health at SeizeTheAwkward.org.

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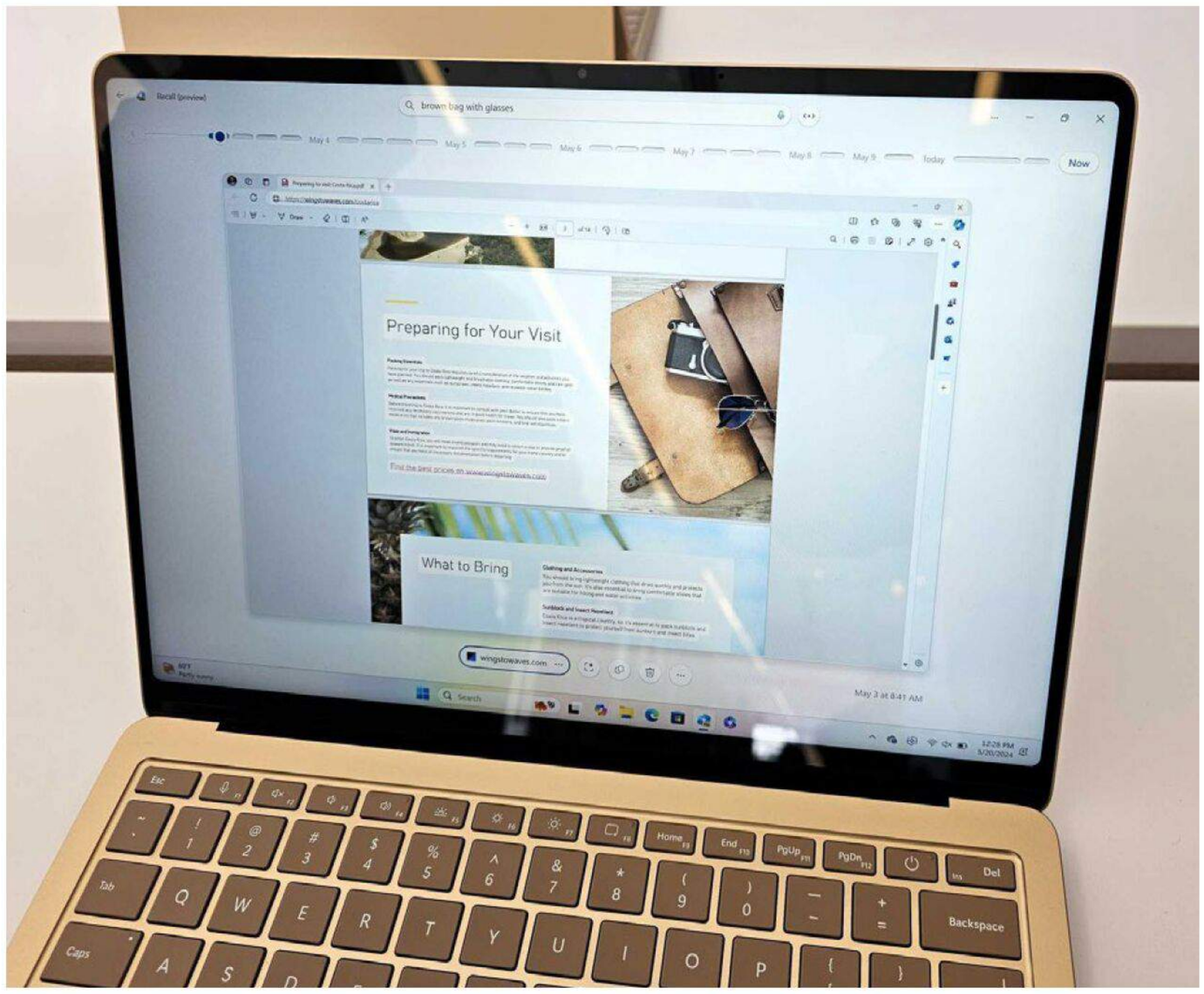
Snapdragon X Elite–powered Copilot+ laptops hit retail, sans Recall

Microsoft's big Arm-powered push to get PC sales moving is here, but it's missing its most dramatic feature. **BY MICHAEL CRIDER**

PC sales have been struggling this year, and giving the Copilot+ label to laptops equipped with newer hardware and the latest Microsoft AI features was supposed to give them a shot in the arm.

The first round of these next-generation laptops, powered by Qualcomm's Snapdragon X chips, are finally available to buy (fave.co/3xTiUCJ), minus the much-touted Recall feature, which has been put on hiatus for the launch.

IMAGE: QUALCOMM



The Recall feature has been delayed due to privacy concerns.

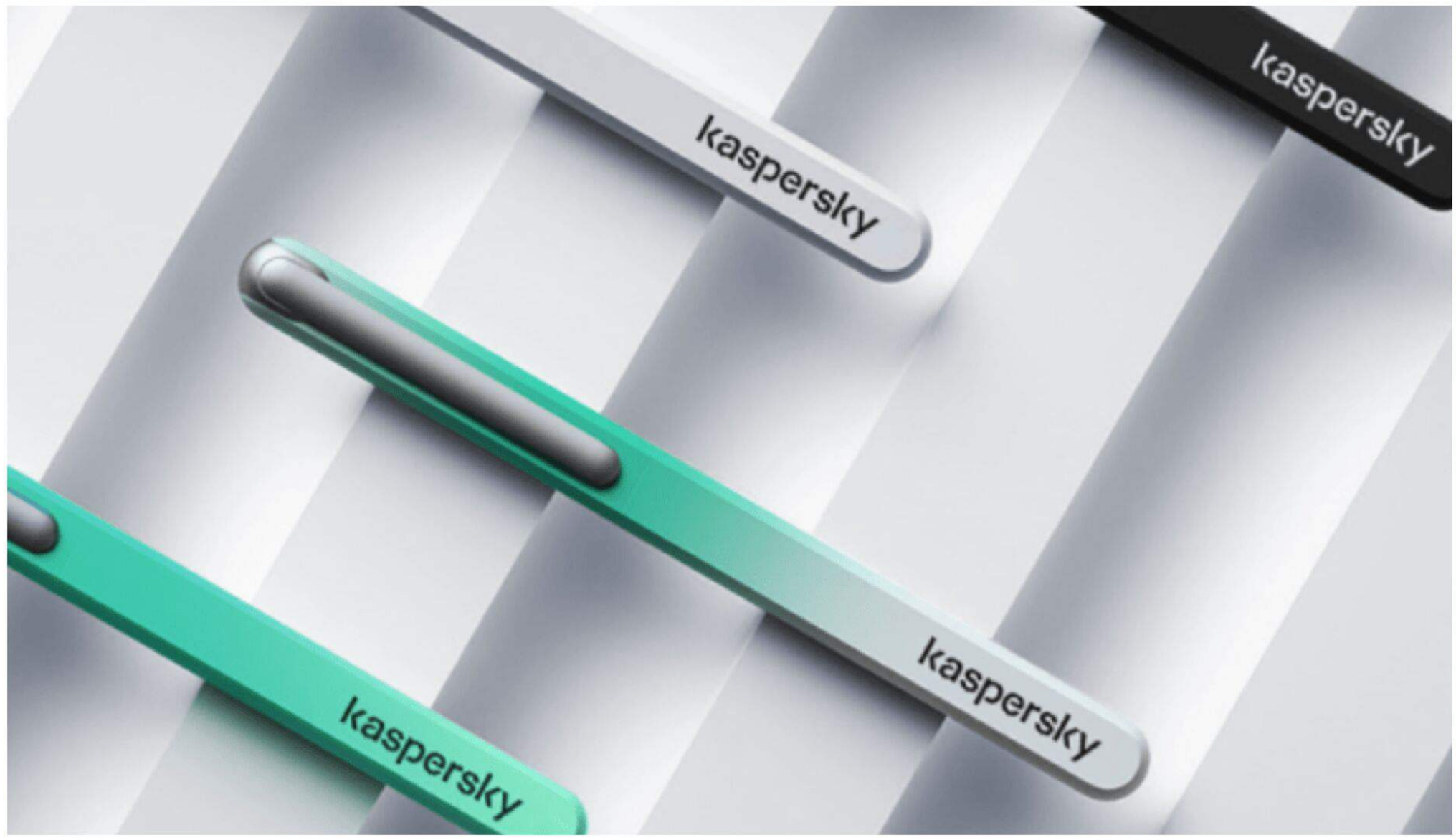
If you buy a new laptop with the coveted Copilot+ label, be aware that one of the key differentiating features that Microsoft has been pushing so hard won't actually be available at launch. The Copilot+ tool, which records more or less every interaction you have with Windows and its applications (fave.co/4bVAAwo), has been delayed (fave.co/4eXeCLf). After a huge amount of initial feedback (including over privacy and safety concerns; fave.co/4d1eVDb), Microsoft has decided to test the feature with Windows Insiders first before releasing it to the general public at a later date.

The showpiece for the Copilot+ program is the new Surface line, including the refreshed Surface Laptop and Surface Pro (fave.co/3xQjYr5), but there are plenty of other choices from the big manufacturers. Dell, HP, Lenovo, Samsung, and Asus all have laptops with Snapdragon X processors and their integrated NPUs with a claimed 45 TOPS performance capacity.

The showpiece for the Copilot+ program is the new Surface line.

Still use Kaspersky AV? The U.S. is banning it, so prepare to switch

You have until September to find replacement antivirus software. **BY ALAINA YEE**



In 2017, Russia-based Kaspersky Antivirus Software was deemed an unacceptable risk to U.S. national security, and thus fully barred from use by federal agencies in 2018. Then, in 2022, Kaspersky earned a spot on the U.S. Federal Communications Commission's blacklist (fave.co/3S2xgrj).

But while federal subsidies could no longer be spent on Kaspersky, individuals and private businesses were still free to buy licenses. This will soon change with an upcoming U.S. ban on Kaspersky's products.

Announced Thursday (fave.co/3LlgPT9) by the Bureau of Industry and Security (a branch of the Department of Commerce), the prohibition applies to antivirus and other cybersecurity software developed and distributed by Kaspersky and its affiliates. The Biden administration cited high potential for interference from the Russian government in Kaspersky's operations as the reason for its decision—the first of its kind.

The ban will roll out in two phases: starting on **July 20 at 12 a.m. ET**, Kaspersky

IMAGE: KASPERSKY

can no longer sell its products to new U.S. persons or agree to integrate its software into third-party products (like white-labeled services); then, on **September 29 at 12 a.m. ET**, all reselling, existing integrations, and licensing must cease. Virus definition and app updates will end, as will operation of the Kaspersky Security Network within the U.S. and on devices belonging to U.S. residents and citizens.

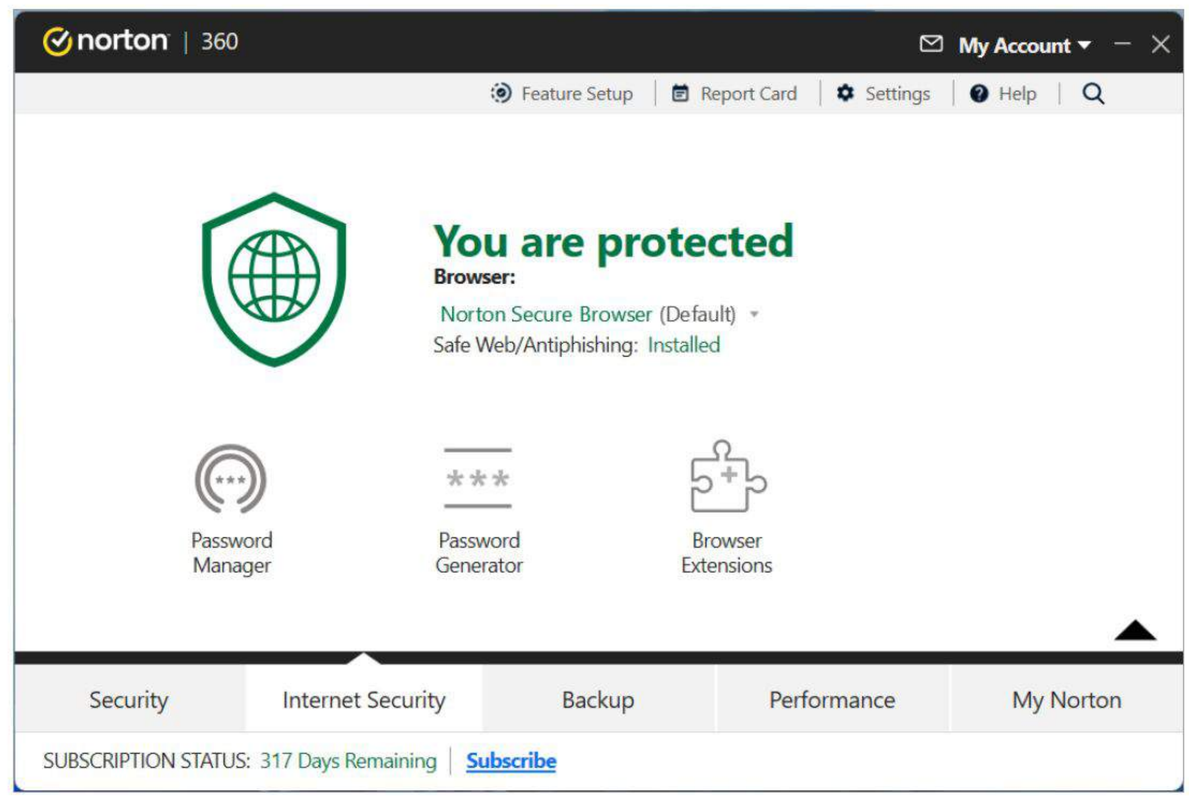
This window gives consumers and businesses time to transition to new software—and there are no legal penalties for continuing to use Kaspersky while you hunt for a replacement.

If you're currently a Kaspersky user, you should switch to an alternative before that September cutoff date—don't leave your PC and other devices unprotected from new threats. If you've been using the free version of Kaspersky, one easy fallback is Windows Security (fave.co/3tXSvPP), the built-in antivirus, malware, and network protections offered by Microsoft with both Windows 10 and 11. For more premium options, check our recommendations of the best antivirus software (fave.co/3CnDHuk), where you'll find apps comparable to the Kaspersky product you're currently using.

For a fuller rundown of the U.S. government's investigation of Kaspersky, you can check out the Bureau of Industry and Security's dedicated site (fave.co/3Lq3yZm). Among the other details given, it explains the reasons for why Kaspersky is now considered a high security risk.

The biggest reasons include the possibility of the Russian government compelling Kaspersky into releasing sensitive data about its U.S. customers, using Kaspersky as a vehicle to plant malware on devices owned by U.S. persons, and spreading malicious code through white-label software to unsuspecting end users.

There's even a link to the documentation that meticulously lays out the government's actions, including its communication with Kaspersky (fave.co/3Y1S0U0) about its analysis. (That could sound like the equivalent of paint drying, but you may actually find the BIS teardown of Kaspersky's proposed mitigations an interesting read.)



If you're currently a Kaspersky user, you should find an alternative, such as Norton 360 Deluxe (pictured).

The first-ever copy of Windows 95 shows up, unopened and pristine

An ex-manager from Microsoft proudly showed off his first edition of Windows 95, which should be worth a lot to collectors. **BY LAURA PIPPIG**

Back in August 2023, Windows 95 became 28 years old. Official support for Windows 95 ended in 2001, to be replaced by Windows 98, then Windows XP, then Windows Vista. (Oof.)

We've previously reminisced about the sometimes joyful, sometimes bug- and problem-plagued times we had with Windows 95. But now a different kind of memento has surfaced.

It's an **original copy of Windows 95**—and not just that, but the first-ever copy of Windows 95 that ever rolled off the production line. And what's most impressive is that it's still shrink-wrapped and unopened.

IMAGE: ROLAND MAGNUSSON/SHUTTERSTOCK

THE FIRST-EVER WINDOWS 95 IS STILL OUT THERE

For collectors, this first-ever edition of Windows 95 is likely to be worth a small fortune. But who still owns this ultra-rare relic?

It's none other than **Brad Silverberg**, an ex-manager at Microsoft. He worked for Microsoft in the 1990s and was responsible for the development and introduction of Windows 95.

That's why this Microsoft veteran, who has since moved on, didn't miss the opportunity to take the first edition of Windows 95 home with him. It was produced on the Release to Manufacturing day (July 14, 1995, at 5:15 p.m.) and contained a total of 13 floppy disks for the upgrade to the then-brand-new operating system.

Silverberg published a photo of the rare original edition on X (formerly Twitter) after a fan asked him for it. He described the item as a "priceless memento" that he cherishes to this day.

WINDOWS 95 WAS A HUGE SUCCESS FOR MICROSOFT BUT HAD ITS FLAWS

Windows 95 became a huge success for Microsoft after its release. Its strengths included not only a new design with the combination of Start menu and taskbar that's still used today, but also the simultaneous running of applications (groundbreaking!) and an impressive gaming interface for the time.

The top games of the time included *Age of Empires*, *Comanche 3*, *The Elder Scrolls II: Daggerfall*, the first *Fallout*, the first *Diablo*, the first *Tomb Raider*, the first *Grand Theft Auto*, the first *Command & Conquer*, *Wing Commander IV*, *Warcraft II*, *Unreal*, and many more.

Windows 95 truly played its part in ushering in a new era for PC gamers, while also boosting PC hardware sales and driving the growth and adoption of 32-bit programs.

However, there were also many problems with Windows 95, especially the numerous security holes and the regular blue-screen occurrences that annoyed users. Nevertheless, Windows 95 quickly established itself and paved the way for many of Microsoft's later successes.

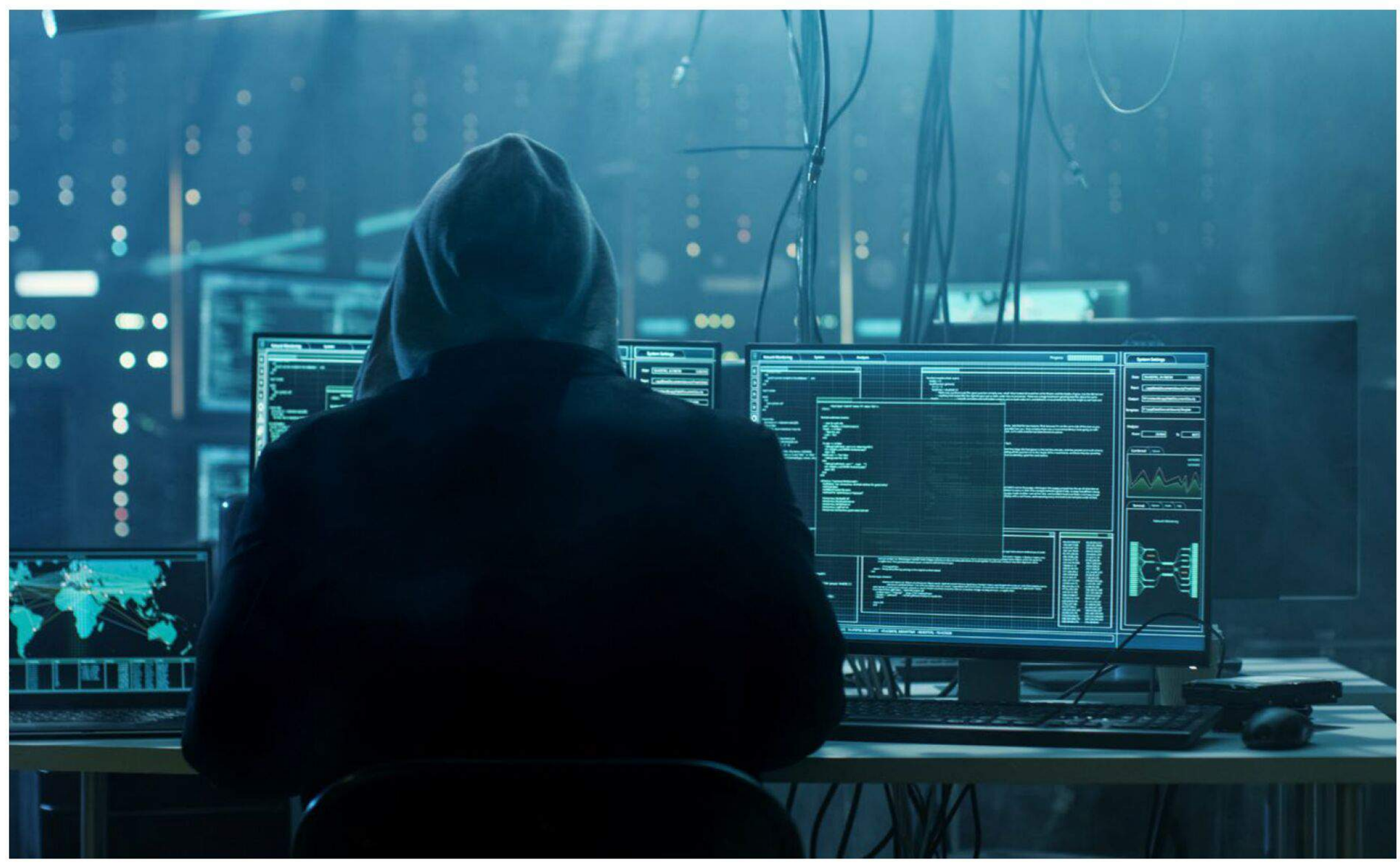
WINDOWS 95 STILL HAS ITS FANS TODAY

It may be hard to believe, but there are still fans of Windows 95 today, one of whom you could even see this year on the stage of Europe's biggest music contest, the Eurovision Song Contest. You can watch Windows95man's crazy performance on YouTube (fave.co/4bHZj6q).

One person commented on the video: "If this song wins, I'm installing Windows 95 again." Fortunately for the user, it didn't come to that.

A hacker just leaked 10 billion passwords. Here's what to do now

You should triple-check that your passwords are secure—or finally make the jump to stronger forms of authentication. **BY ALAINA YEE**



Hacking into an account doesn't always require deep expertise in exploiting vulnerabilities. Sometimes it's as simple as taking leaked information and placing it elsewhere on the internet. That's why the release of massive password collections are dangerous—and why alarms are now sounding over a drop of nearly 10 billion passwords.

First spotted in a forum on July 4, RockYou2024 is a compilation of 9.94 billion leaked passwords. The massive password dump includes entries from the RockYou2021 collection (fave.co/3LlHoYk), data from newer breaches and leaks, and data cracked by the person who posted it. RockYou2021 released with 8.4 billion password entries, including millions related to social media sites. For comparison, the Mother of All

IMAGE: GORODENKOFF/SHUTTERSTOCK

Breaches (fave.co/4cEwI2Y) contained 26 billion pieces of personal data that included information beyond passwords.

You can read up on the full details of RockYou2024 in Cybernews' report (fave.co/4cCXPf1), but this discovery's biggest takeaway is that everyone should shore up their account security right away. If you haven't changed your passwords for compromised accounts (especially after the big Ticketmaster breach in late May; fave.co/3WgIoDk), or if you reuse passwords, you could become an easy victim of credential stuffing—which is when someone tries your leaked login info across the web, and sees what accounts they can get into.

To better protect yourself, take these steps:

Use a unique, random, and strong password for each account. Character strings that can't be easily guessed are the way to go—think along the lines of *pastaturnfriendlyamalgamation20*, rather than *gu3$$this*.

Set up a password manager. Good passwords can be hard to remember, especially if you've got many to keep track of. A password manager can help you keep track of your whole collection and simplifies entering longer, complex ones into login forms. Dedicated password managers (fave.co/3IRkfRz) are more flexible and have more features, but the ones included with an antivirus suite (fave.co/3CnDHuk) or even Apple's, Google's, and Microsoft's built-in password managers are helpful. (Just be sure to separately memorize your email password; fave.co/3W3rDdL.)

Add two-factor authentication (fave.co/41SY7rQ) **to your accounts where available.** You'll have another layer of protection to thwart credential stuffing attacks. Because they can't pass that second security check, hackers can't login as you. These days, one-time passcodes generated by an app best balance simplicity and security, but you can also use hardware dongles as a stronger option.

Upgrade to passkeys. Two-factor authentication improves password security, but it's not foolproof, since some 2FA methods are vulnerable to phishing attacks. You can sidestep this issue by using passkeys (fave.co/3zELLLx) to log into an account instead. Due to how they're designed, they are inherently unique, don't require you to memorize any information, and can't be phished. If a hacker steals a website's customer login info, that data can't be used to get into that site or others.

I personally recommend switching to passkeys (fave.co/463wiRx) whenever possible—they require much less thought or effort than passwords. All you need is a good backup for your passkeys (in case you lose your phone or PC, which is where they'll be stored). Good news is, many major password managers now let you store passkeys on them, too.

Department of Justice sues Adobe for hiding fees when you try to cancel a subscription

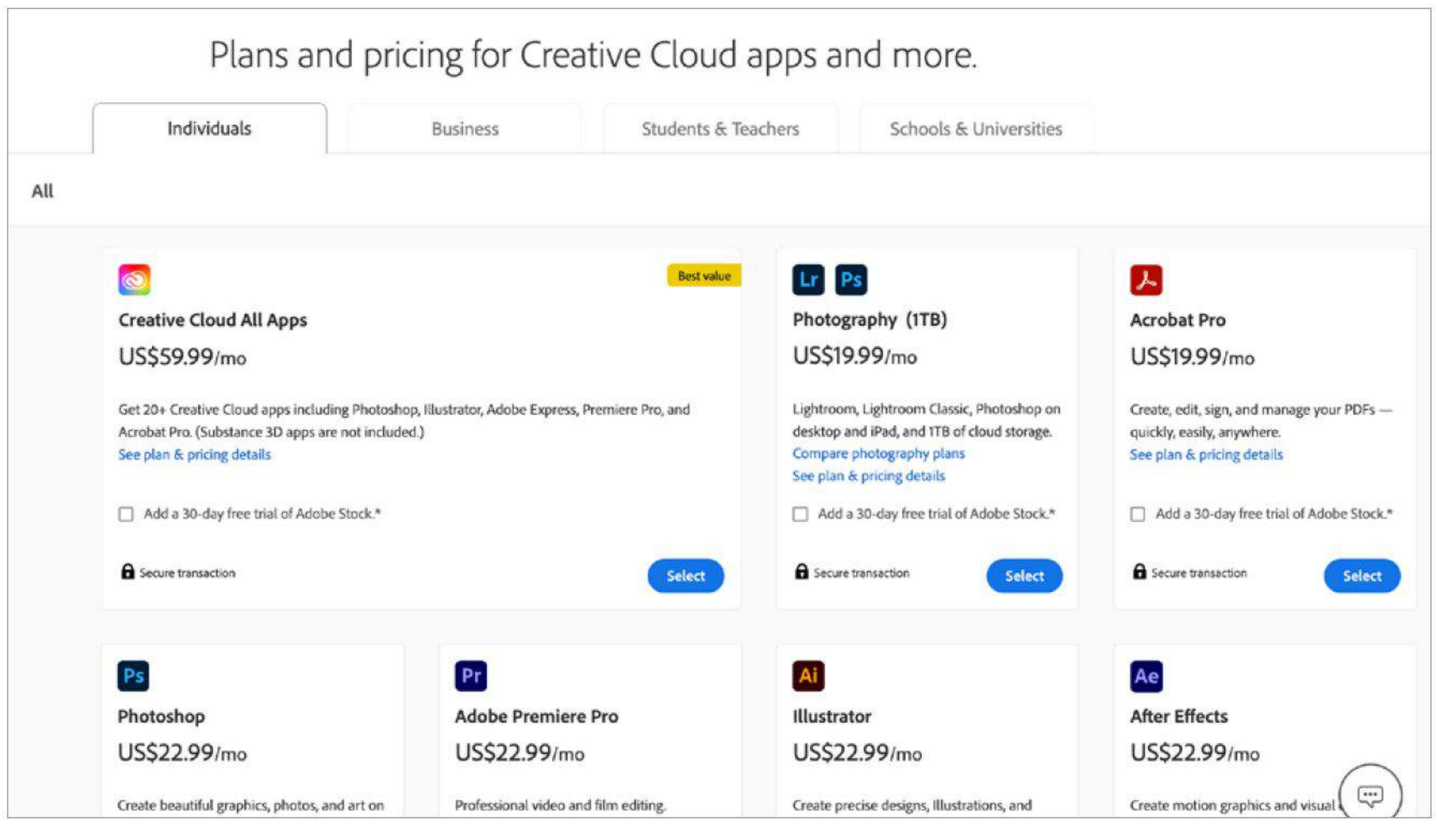
The fees can run into the hundreds of dollars, the government says, and accompany a yearlong commitment for services like Adobe Photoshop. **BY MARK HACHMAN**

The U.S. Department of Justice sued Adobe on Monday, alleging that its terms of service for apps like Creative Cloud and Photoshop included cancellation fees that were applied when consumers signed up for a one-year subscription.

"For years, Adobe has harmed consumers by enrolling them in its default, most lucrative subscription plan without clearly disclosing important plan terms," the DOJ alleged (fave.co/3S2XhGS) in its suit, filed in district court in Northern California.

Specifically, the DOJ alleged that Adobe only disclosed the fact that signing up for an "annual, paid monthly" plan forced consumers to commit to a year's subscription as well as "hefty" early termination fees in the

IMAGE: CHRISTOPHER E ZIMMER/SHUTTERSTOCK



It's alleged that Adobe only makes the ETF clear after a consumer tries to cancel their subscription.

hundreds of dollars. Adobe only makes the ETF clear after a consumer tries to cancel, the suit says. Otherwise, they're hidden behind optional textboxes and hyperlinks, it said.

"Adobe then deters cancellations by employing an onerous and complicated cancellation process," during which it surfaces the cancellation fees, the DOJ said.

In one exchange cited by the government, a consumer cited a "negotiation" that they went through to get out of their subscription. "I have corresponded with Adobe on the phone and via their chat support over three times in the last few months to try and cancel my membership," they said, as cited by the DOJ. "Each time I try to cancel, there is a rigorous negotiation and instead of allowing the user to cancel their account, they offer two months at no charge."

The DOJ is asking for, among other things, fines and a permanent injunction against Adobe's behavior.

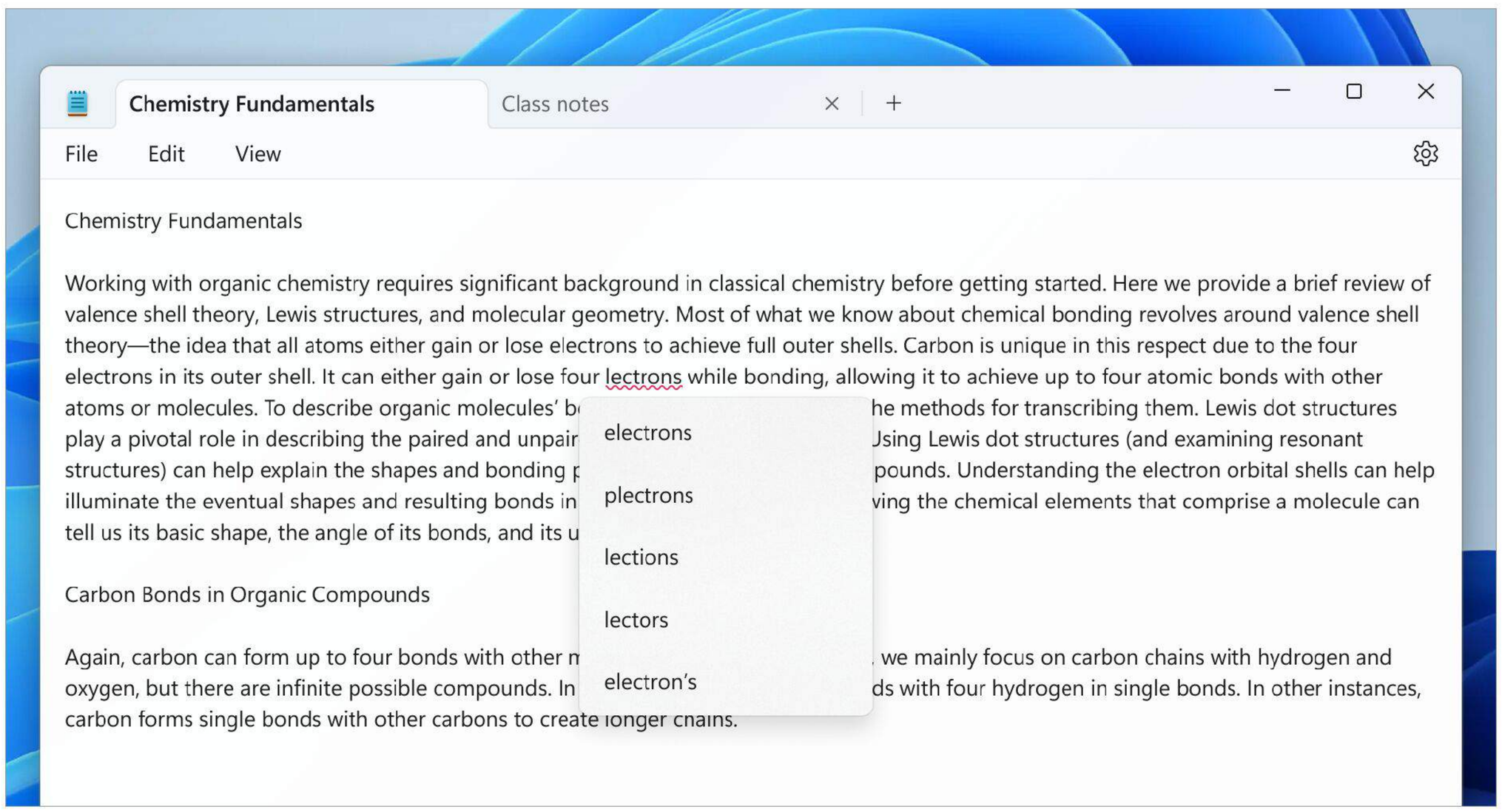
Adobe had yet to issue a response by press time.

IMAGE: JHVEPHOTO/SHUTTERSTOCK

At the time of writing, Adobe had yet to issue a response.

Over 40 years later, Windows' Notepad finally has spell check

After more than four decades, the latest version of Notepad sent out to Windows 11 users includes spell check and auto-correct options. **BY MICHAEL CRIDER**



Earlier this year, Microsoft killed WordPad—the free and surprisingly capable built-in word processor that debuted in Windows 95. For this, they must be punished. Yet while Microsoft taketh away, they also giveth.

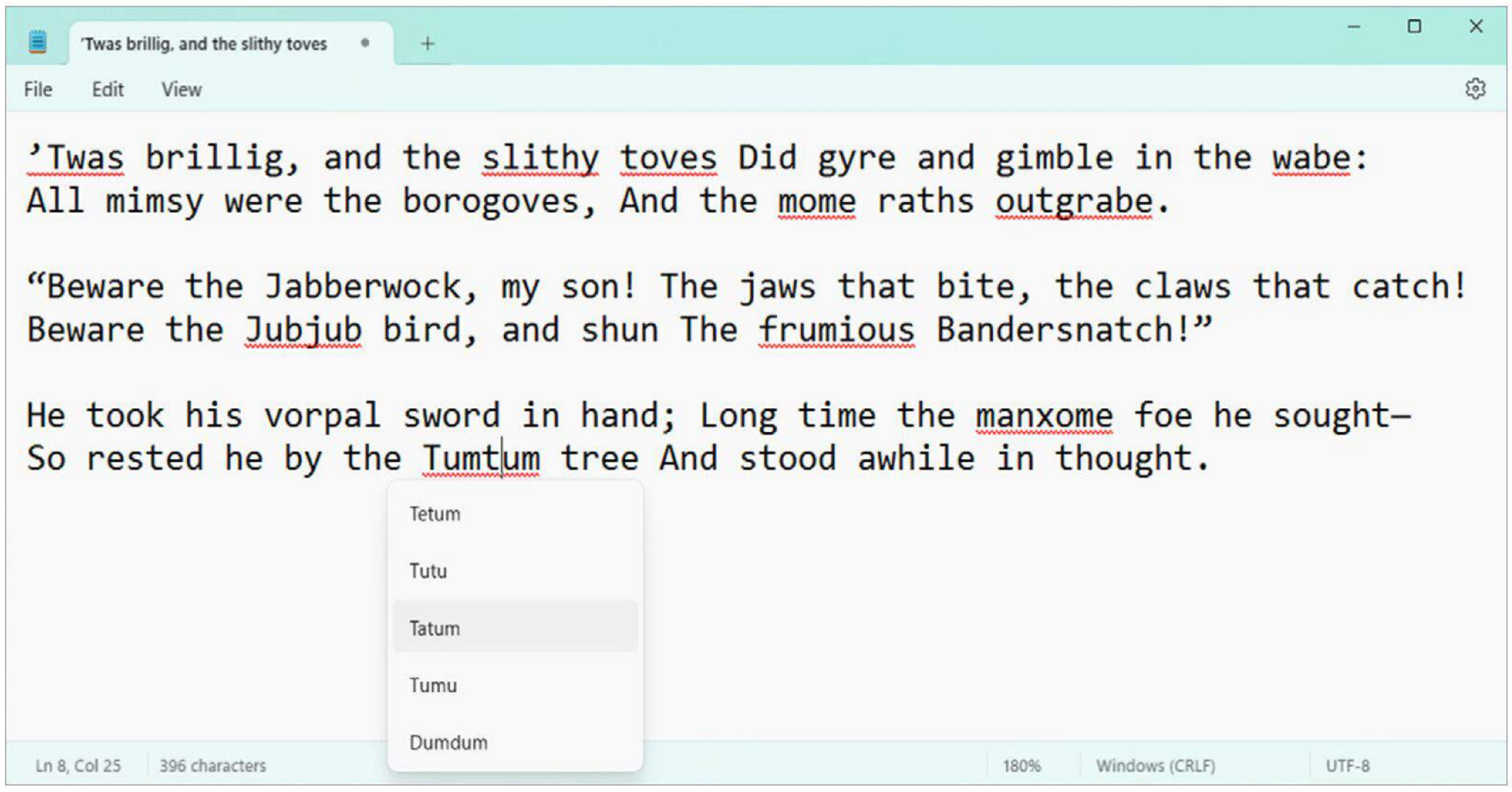
After several months of testing, the Notepad text editor is finally getting spell check and auto-correct features. Maybe that'll even things out.

We reported on this back in March (fave.co/4bIDpjn) when this upgrade to Notepad began rolling out to Windows 11 Insider builds. Now it appears that it's done with testing and heading out to everyone (or at least about 20 percent of everyone, since a lot of you are still on Windows 10; fave.co/3WhBo9s).

The Verge notes (fave.co/4bIjMYP) that Notepad's spell check feature appears to be there in the latest update—and sure enough, my own Notepad copy is showing those familiar red squiggly lines.

Other recent upgrades to Notepad include character counts in the lower task

IMAGE: MICROSOFT



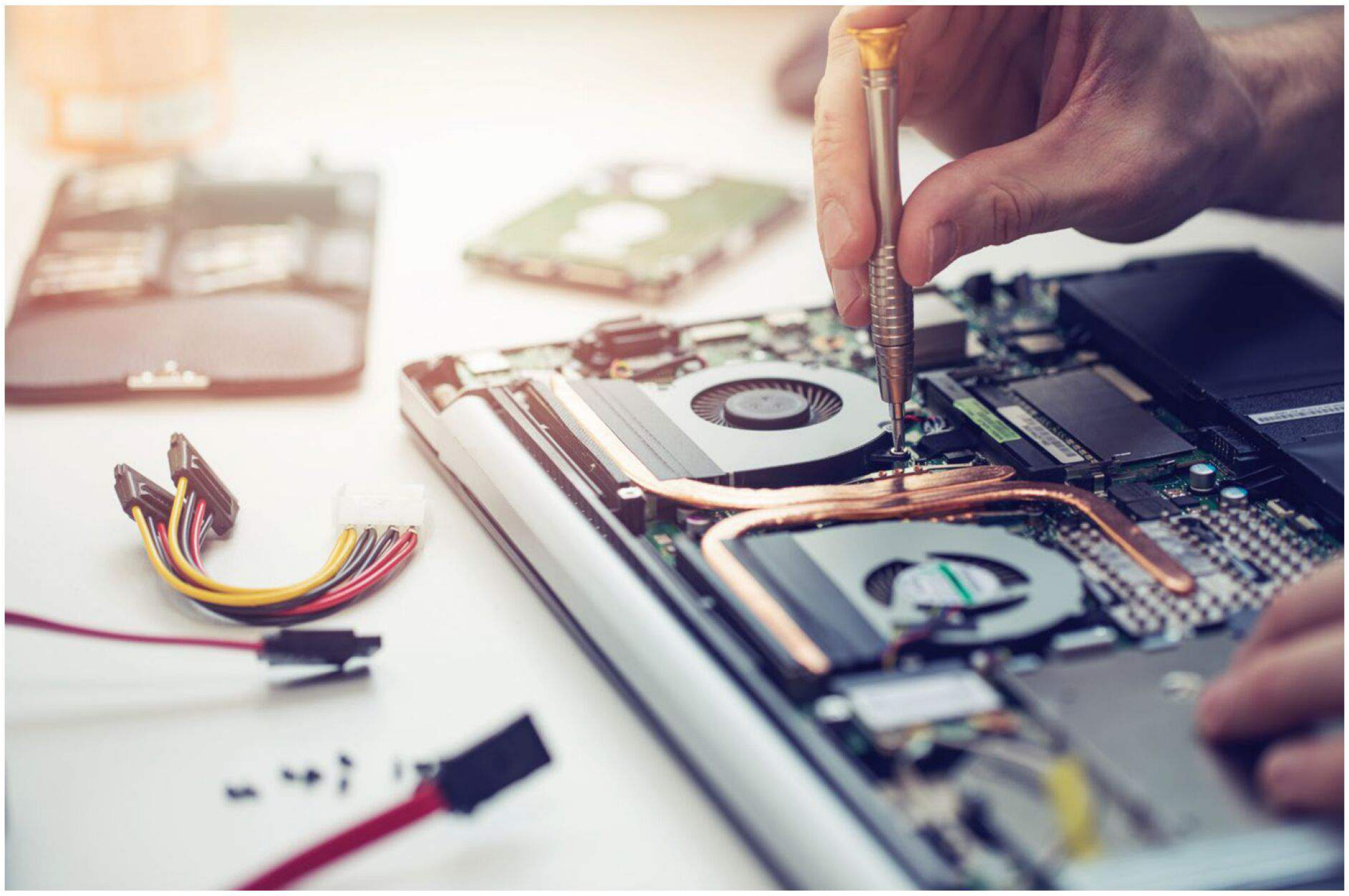
Notepad's spell check feature is there in the latest Windows update.

bar (but oddly enough, not word counts), tabbed viewing for multiple files, and support for Windows dark mode. If you enable the "Explain with Copilot" feature, you can even get some generative AI in your text editor.

Why all this wasn't worth adding to WordPad, I'll never know…unless it's just Microsoft trying to give people yet another nudge to pay for Office, which would be in character (fave.co/3K1AEhv). Notepad is a lot more than just the default text editor. It's also the default viewer for a lot of essential program files, like the INI files used for configuration settings in a lot of Windows games.

So I'm particularly impressed that Microsoft had the foresight to let you choose to automatically disable spell check on some file types (though the list of options is pretty short at the moment).

Notepad's spell check settings.



FTC warns three PC tech firms of potential warranty violations

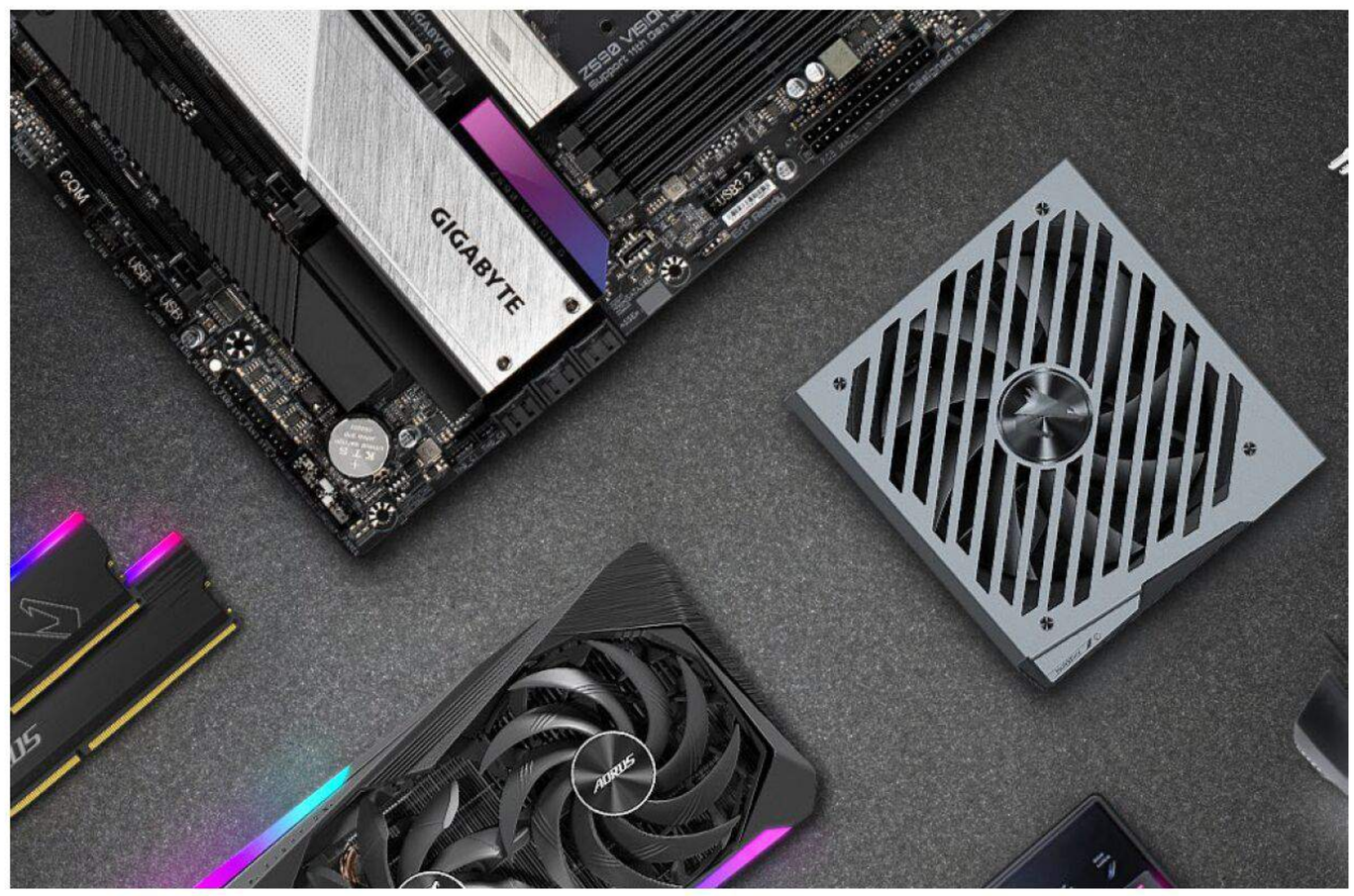
The Federal Trade Commission would like to remind you that yes, you can repair your own PC. **BY MARK HACHMAN**

The U.S. Federal Trade Commission said Wednesday that it has sent letters to several technology companies warning them that their warranty or repair policies might violate federal law.

Specifically in the PC space, the FTC sent letters to companies ASRock, Gigabyte, and Zotac, warning them that they may be in violation of the Magnuson-Moss Warranty Act, the federal act that oversees consumer warranties and is administered by the FTC. They have thirty days to review their policies and comply.

While the specific concerns vary by company, the FTC reminded the three companies that they can't, for example, place stickers on a laptop that caution consumers

IMAGE: RONSTIK/SHUTTERSTOCK



The FTC says its staff is "concerned" by Gigabyte's written warranty.

that opening or repairing the laptop violates warranty policies. Neither can they state or imply that their products can only be repaired via an authorized service from the company.

In the letter sent to Gigabyte (fave.co/4eYCdLC), the FTC said that its staff is "concerned" by the Gigabyte written warranty, which includes the phrase: "If the manufacturing sticker inside the product was removed or damaged, it would no longer be covered by the warranty."

ASRock's warranty policy is more specific, but the FTC's letter to the company (fave.co/3zFRxN7) took issues with it as well: "Manufacturer's warranty will be null and void if products are modified, damaged or otherwise tampered with, for example, the outer case is opened or additional optional parts/components are installed/removed."

Staff would also be "concerned" if the companies actually denied warranty coverage based upon the statements by the three companies. While the language is somewhat passive-aggressive, the FTC also clearly states that the violations may result in legal action.

The FTC sent similar letters to sellers of air purifier equipment, specifically to Aeris Health, Blueair, Medify Air, and Oransi, plus treadmill company InMovement. Asus, which was the subject of a series of videos by GamersNexus for its own warranty practices, was not named.

ASRock also received a warning letter from the FTC.

The Amazon triangle scam: What it is, how it works, and what to do

Triangulation fraud is a type of scam that occurs on e-commerce marketplaces—including Amazon. **BY FLORIAN KASTNER**

You spot an insane deal on Amazon. You click to buy as fast as you can so nobody can swipe it away from you. You receive the product and it doesn't seem like a counterfeit. You won! All good, right?

But a few weeks later, you're surprised by a debt collection letter or even a fraud report for an order you never placed. Sorry to say, you've been hit by triangulation fraud.

Keep reading to learn how a triangular scam works, what to look for, and what to do if you find yourself a victim of it.

TRIANGULATION FRAUD ON AMAZON AND HOW IT WORKS

Triangulation fraud involves three people: the buyer (you), the scammer, and a legitimate seller with a legitimate product.

IMAGE: ELPISTERRA/SHUTTERSTOCK

It all starts with the scammer, who puts up a fraudulent listing on a marketplace that allows third-party sellers—for example, Amazon. (But it could certainly happen elsewhere, too.)

This fraudulent listing is usually for a popular big-ticket product, and the listed price is significantly lower than you'd normally see for it. Not only does this make the deal more enticing, it puts time pressure on you to buy ASAP because you don't want to miss out.

Once you buy the fraudulent listing, the scammer pockets your payment and then uses *stolen* payment information (that they acquired elsewhere) to order a genuine copy of the product from a legitimate seller. The product arrives on your doorstep and you're none the wiser.

However, the legitimate seller will likely face chargebacks because the product was ordered fraudulently—they'll be forced to refund the stolen payment method, pay extra chargeback fees, and lose out on the product that now resides with you.

In some cases, the legitimate seller may try to reach out to you for the product back, which you might ignore because you never ordered from this seller. This could also lead to debt collection letters or fraud charges.

On the flipside, if your credit card details are ever stolen, you could be the one who spots fraudulent purchases on your statements because a scammer is using your information to conduct triangulation fraud.

WHAT TO DO ABOUT TRIANGULATION FRAUD

You should always be vigilant when shopping online. Be suspicious of offers that seem too good to be true—because they usually are.

Tip: Compare the prices of a product on different platforms.

When you receive a package, be sure to check the sender's address to make sure it comes from the actual seller from whom you bought. If it comes from someone else, they've likely drop-shipped to you—and it's possible that they did so using stolen payment info.

Always use secure payment methods that offer buyer protection or chargeback options, such as credit cards and PayPal.

If you're the victim of fraud, you should proceed as follows:

Press charges: Contact the police and press charges.

Inform the legitimate seller: Approach the legitimate seller who shipped you the product and explain the fraud.

Notify Amazon: Report the fraud to Amazon (fave.co/3y5sjqN) so that the scammer's fake listings are taken down.

Contact the payment service provider: If you see fraudulent purchases on your own statements, contact your payment service provider and request refunds.

With these measures, you can protect yourself against triangular fraud and react correctly if it happens to you. Stay vigilant and don't be fooled by supposed bargains.

Think
that's
scary?
Sharks can be terrifying.
But what's really scary,
and even deadly,
is distracted driving.
Eyes forward.
Don't drive distracted.
NHTSA
ad
COUNCIL

If you are anywhere in your journey with substance use disorder,

I want you to stop,
look around
and open your heart.

Revel in the abundance
of your existence.
See how small
substance use disorder
can be when sat next
to all that you are
or ever could be.

Fill your existence
with beauty, purpose
and a life of service.

And your substance
use disorder—
your history of
addiction,
the things you
may have done
that you are not
proud of—will one day
be small enough
to deal with
while allowing you
space to live this life
of joy.

Hold on.

We are not the sum
of our scars but rather
a beautiful mosaic of the
life they hold together.

—Joseph
Washington, DC
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substance use
disorder

Learn how substance use recovery can

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NATIONAL COUNCIL *for* Mental Wellbeing

Shatterproof
Stronger than addiction

ad COUNCIL

Microsoft Surface Pro (2024): A tantalizing glimpse of the future

This feels like the promising start of a new era for Windows laptops. **BY MARK HACHMAN**

Microsoft desperately needs its new Surface Pro (2024) 11th Edition Copilot+ PC to be a success. It's something like 80 percent of the way there. But the most important thing this Windows on Arm tablet accomplishes is point to what feels like an inevitable future for productivity PCs…someday.

You've seen a Surface Pro before. Weirdly, this 13-inch tablet is the least interesting part of the whole affair. *Inside* is the key: How well does Qualcomm's new Snapdragon X Elite work? Do the new AI experiences actually

IMAGE: MICROSOFT

make a difference? And can Windows on Arm finally replace an X86 PC from AMD or Intel?

I have answers. An expanding ecosystem of native Arm apps run great on this tablet, and when it's plugged in, the performance seems to be on par with or even better than that of Intel's Core Ultra (Meteor Lake). But whether the app will run is still, unfortunately, a question. When unplugged, the story changes yet again, with intensive apps gobbling up great chunks of the tablet's prodigious battery life. And I'm just not seeing enough in Microsoft's Copilot+ AI features (see page 94) to overshadow that story—yet. But the hardware? It's rather good, minus some weirdness.

Because of this, this review will be much longer than normal, even though I've tried to break out some of the topics into separate articles. Join me in the deep end of the pool.

Microsoft's Surface Pro (2024) 11th Edition is among the cheapest options for a Copilot+ PC.

BUYING OPTIONS

After literal decades of pricing the Surface at or above the prices offered by its rivals, Microsoft's Surface Pro (2024) 11th Edition is among the cheapest options for a Copilot+ PC. The Surface Pro costs as little as $999 ($899 for an educational discount), though that features a less powerful 10-core Snapdragon X Plus (fave.co/462FGoo) processor inside. Our review unit included the more powerful 12-core Snapdragon X Elite. A new OLED display option and up to 32GB of RAM and a terabyte of SSD storage bump up the total price to a current maximum of $2,099.99. It appears that Microsoft does not offer an LCD option with the Snapdragon X Elite at press time.

By comparison, the Surface Pro 9 ranged from $999 to $2,599 for a 12th-gen Core chip and $1,299 to $1,899 for the Surface Pro 9 (5G), the tablet with the older Microsoft SQ3 chip, a derivative of the Snapdragon 8cx Gen 3, inside.

DETAILED SPECIFICATIONS

Display: 13-inch PixelSense Flow (2880×1920, 267 PPI, Gorilla Glass 5) up to 120Hz with dynamic refresh rate and 10-point multitouch, optional OLED screen

Processor: Qualcomm Snapdragon X Elite 3.4GHz X1E-80-100 (as tested), Snapdragon Plus

Graphics: Qualcomm Adreno

Memory: 16, 32, 64GB LPDDR5X (OLED), 16GB (normal) (16 GB as tested)

Storage: 512GB, 1TB PCIe Gen 4 SSD (OLED); 256, 512GB (normal) (512GB as tested)

Ports: 2 USB-C (USB 4.0 w/DisplayPort 2.1), 1 Surface Connect port, 1 Surface Keyboard Port

Security: Camera (Windows Hello), NFC/smartcard reader; TPM 2.0 chip

Camera: Quad HD (1440p) ultrawide (user-facing) with Windows Studio Effects, 10MP rear-facing

Battery: 51.4Wh (design) 53.5Wh (full charge)

Wireless: Wi-Fi 7, Bluetooth 5.4

Operating system: Windows 10 Home or Windows 11 Home 24H2

Dimensions: 11.3 x 8.2 x 0.37 inches

Weight: 1.97 pounds without accessories

Color: Sapphire, Dune, Platinum, Black

Price: $999 on up ($1,499 as tested)

Optional accessories: Surface Slim Pen 2 (fave.co/466JEw0), $90 on sale at Amazon. Surface Flex Keyboard with Slim Pen (fave.co/3XXJMfv), $449.98 at Microsoft.

BUILD QUALITY

Physically, the Surface Pro (2024) 11th Edition feels very similar to the Surface Pro 9 (5G), fave.co/3ghcbtC, enough that you'd have to take a close look to tell the two apart. Microsoft ships the new Surface Pro in packaging that matches the metallic color options: Black, Platinum, Dune, and Sapphire. As usual, the keyboard and pen (the new Surface Flex Pro keyboard plus the bundled Slim Pen 2) are "optional" add-ons that are really not optional.

The Surface Pro is somewhat unique, in that there aren't too many Windows tablets in the market. The physical design is consistent from Surfaces past, with slim bezels that extend just about 0.25 inches

There's just the Surface charger slot on the right side of the Surface Pro (2024).

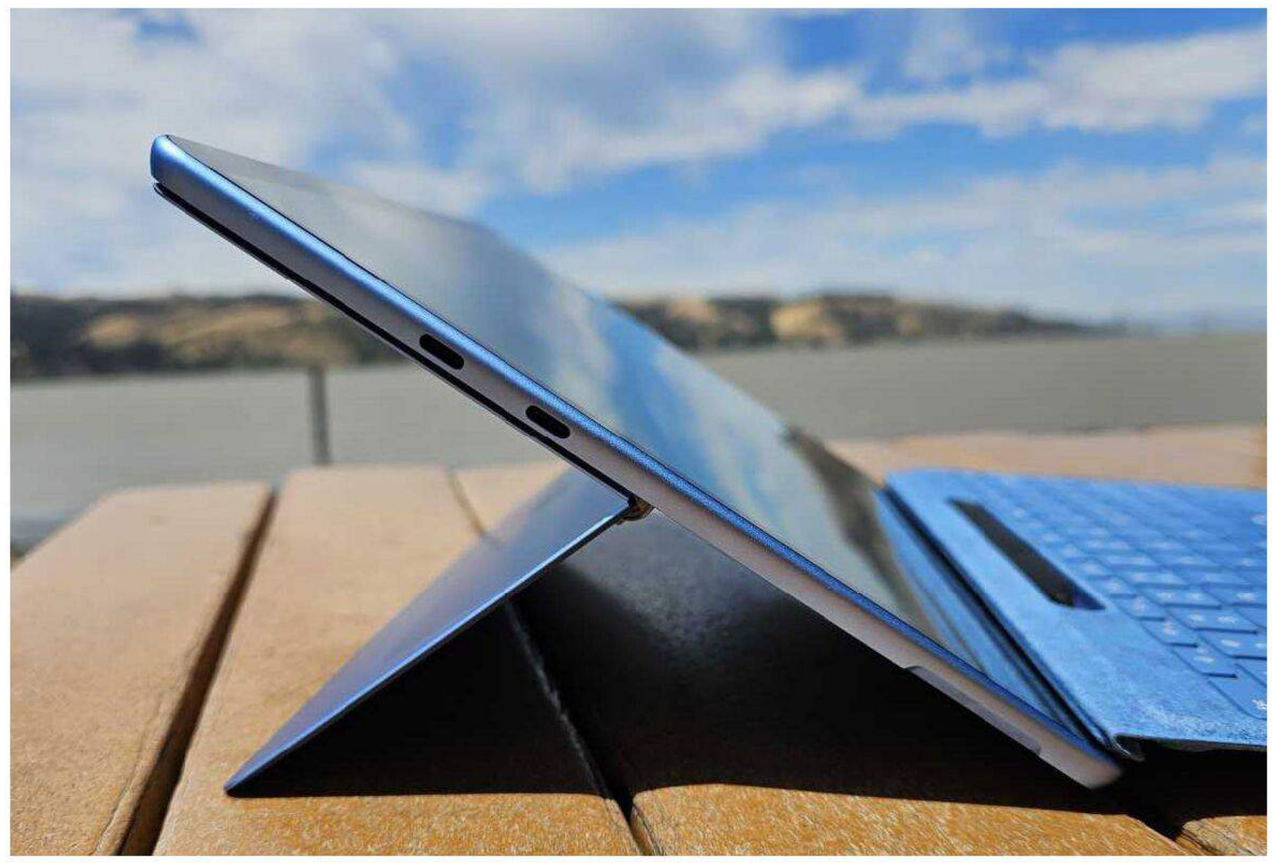
from the side and about 0.5 inches from the top. I tend to use the Surface Pro as a laptop of sorts, but be advised that the Surface tablet mode is gone. That does make the new Surface Pro less of a traditional tablet and more of just an oddly designed laptop. You might walk away thinking that the Surface Pro could have been a 360-degree convertible version of the Surface Laptop Go (fave.co/3WmildZ) instead.

If you do use it as a desktop device, Microsoft has left the kickstand in place. The significant change is the new "wireless" Flex Pro keyboard, which changes the Surface Pro experience. We'll talk about that in a bit.

Subtle differences usually distinguish one Surface generation from the next. In this case, the small bands that distinguished the 5G antennas in the Surface Pro 9 aren't there; while the Surface Pro supports a nanoSIM 5G card, 5G support isn't yet available and will arrive in the coming months. It's not clear whether the physical design will change.

Essentially, though, the latest Surface remains unchanged, with the same dimensions and essentially the same weight. Microsoft placed the power button and volume rocker on the top, as before, with a pair of USB4 (the non-Intel equivalent of Thunderbolt 4 ports) to the left of the chassis. A Surface Charger port is on the right. Microsoft ships a tiny 39W charger with the Surface Pro, though without the built-in USB charging port other Surface chargers include.

What Microsoft calls the out of the box (OOBE) setup experience (fave.co/46lixOh) felt a bit lengthier than normal. Microsoft advertises some of the AI features within Windows, but makes sure to note that the delayed Recall feature (fave.co/4eXeCLf), aka "quickly find things on your PC," isn't here yet but will be coming soon. From what I can see, all of the obvious shortcuts for creating a local account are gone, which jives with our report that Microsoft has deleted its guide to local accounts within Windows (fave.co/4bDKtxP).



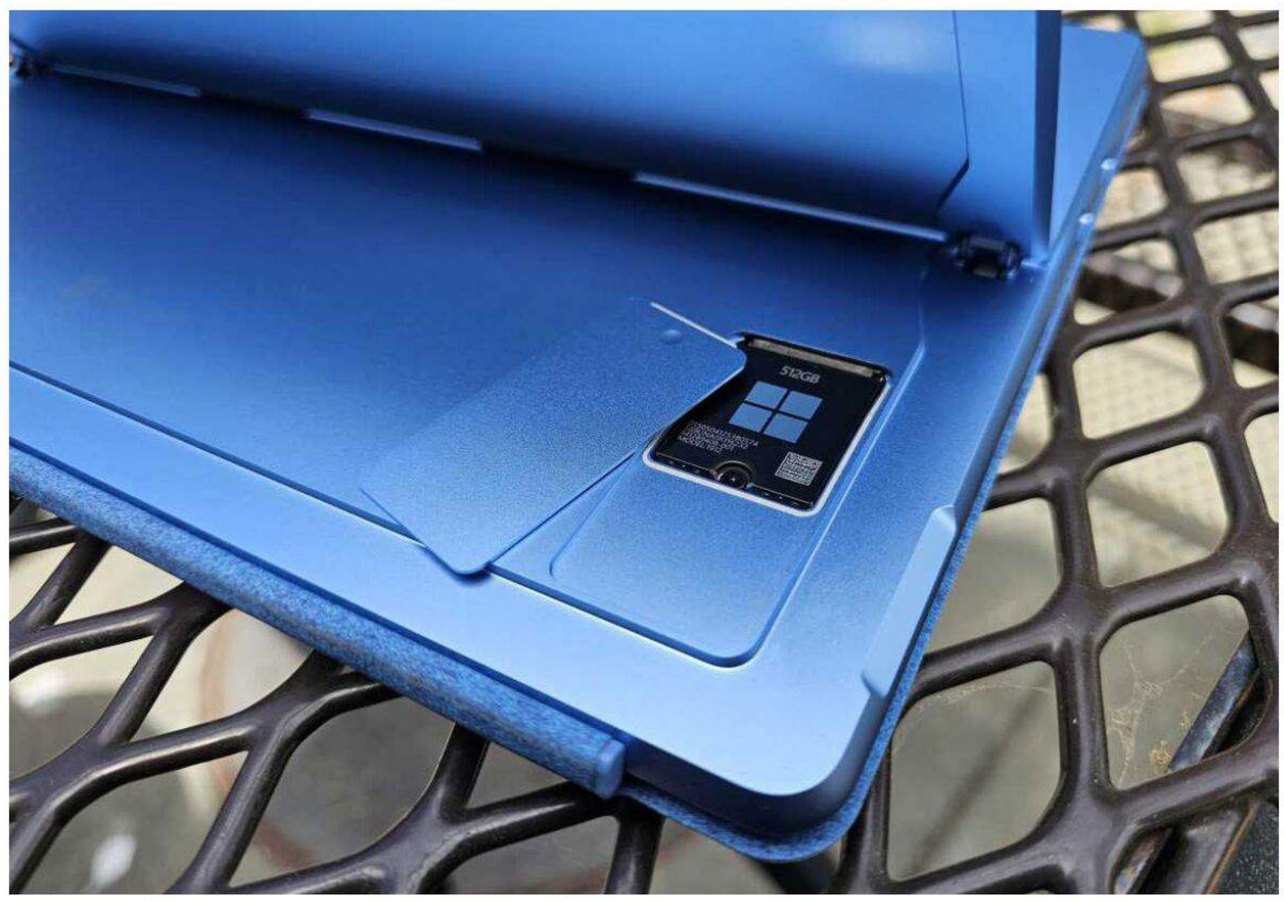
A pair of USB4 ports are on the left side of the Surface Pro (2024).

You can charge the new Surface Pro either via the charger or via the USB ports, and the charger powers and charges the tablet even under load. The tablet worked perfectly

attached to a Thunderbolt 4 docking station (fave.co/3vtA0BE) and a pair of 4K displays. Note that the headphone jack has disappeared, so you'll need either USB-C headphones or Bluetooth to listen to private audio, or use a dock or a USB-C dongle (fave.co/30z4JBG) with a headphone jack built in.

Though Microsoft built an Arm chip inside the latest Surface Pro, the tablet is definitely not fanless. Under load, you'll hear the fan pick up somewhat significantly, though there's no distracting coil whine. While the fan won't kick in under normal office work, you will probably notice it under workloads like Photoshop, for example. It will *significantly* kick in under an emulated workload, as the CPU runs flat out. Then you'll hear the fan and feel the back of the tablet get quite hot. I measured a temperature of about 108 degrees Fahrenheit, but my colleagues using the new Surface Laptop noticed even higher temperatures.

While there is no longer any SD or microSD slot, Microsoft does allow an officially trained repair shop to upgrade the SSD. Access is via a rather nifty magnetically attached back panel that you just flip up by depressing the small divot, then unscrewing the SSD from its slot.

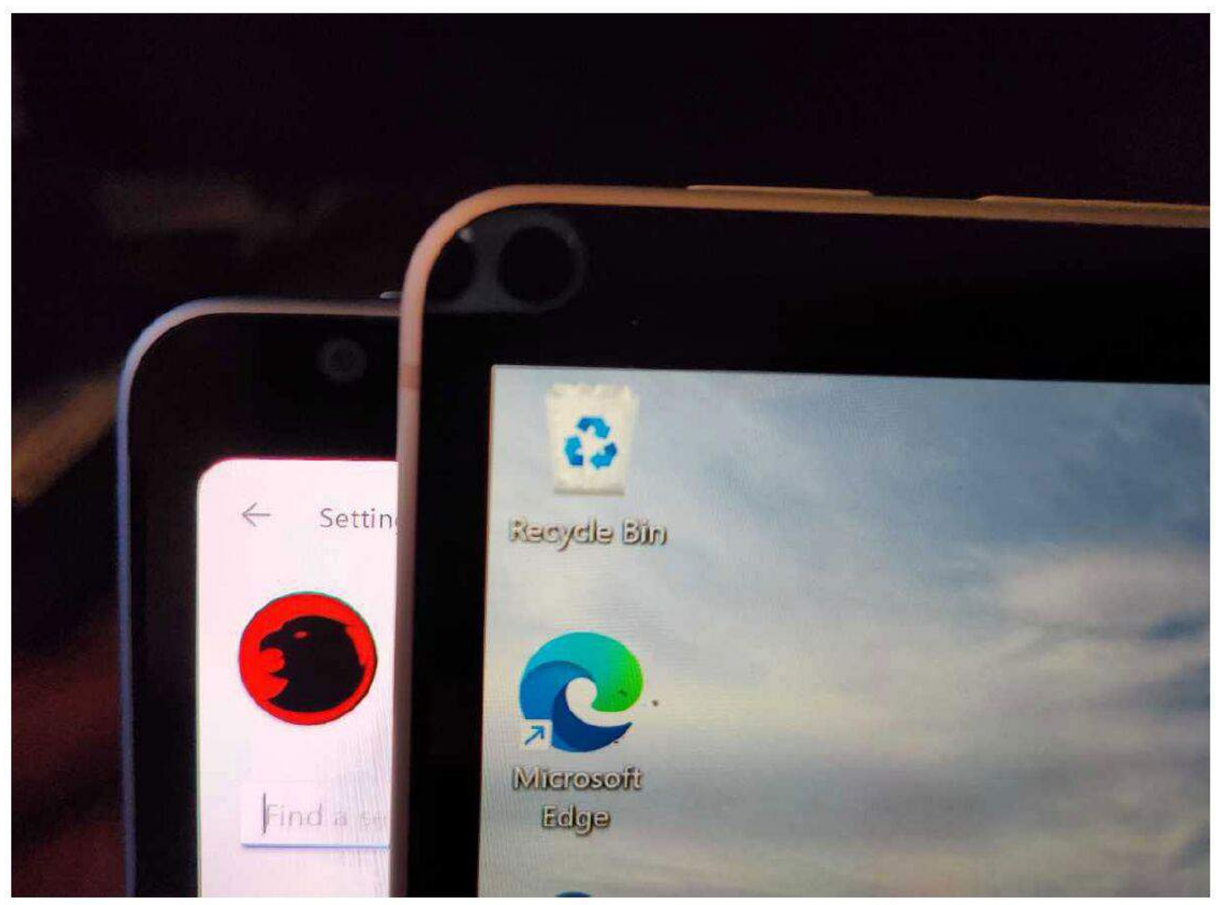


Access to the SSD is via a magnetically attached back pane.

DISPLAY

The Surface Pro (2024) 11th Edition's display is a mixed bag. The Surface Pro ships with either a 13-inch (2880×1920, 267 PPI) PixelSense Flow LCD or an OLED display, and Microsoft shipped our review unit with the latter option. Microsoft's public specifications say that both sRGB and Vivid color options are available, though only a special HDR color profile was present on my review unit.

The OLED display is gorgeous, as OLEDs are, with inky blacks and stunning contrast. But you may notice a small bit of grain, depending on how sharp your eyes are. Using the Surface Pro 9 (5G) LCD screen for comparison, I noticed some speckling of what looked like individual pixels on the Surface Pro's OLED screen. To be fair, I didn't notice this until others pointed this out during the review process, but it's there.



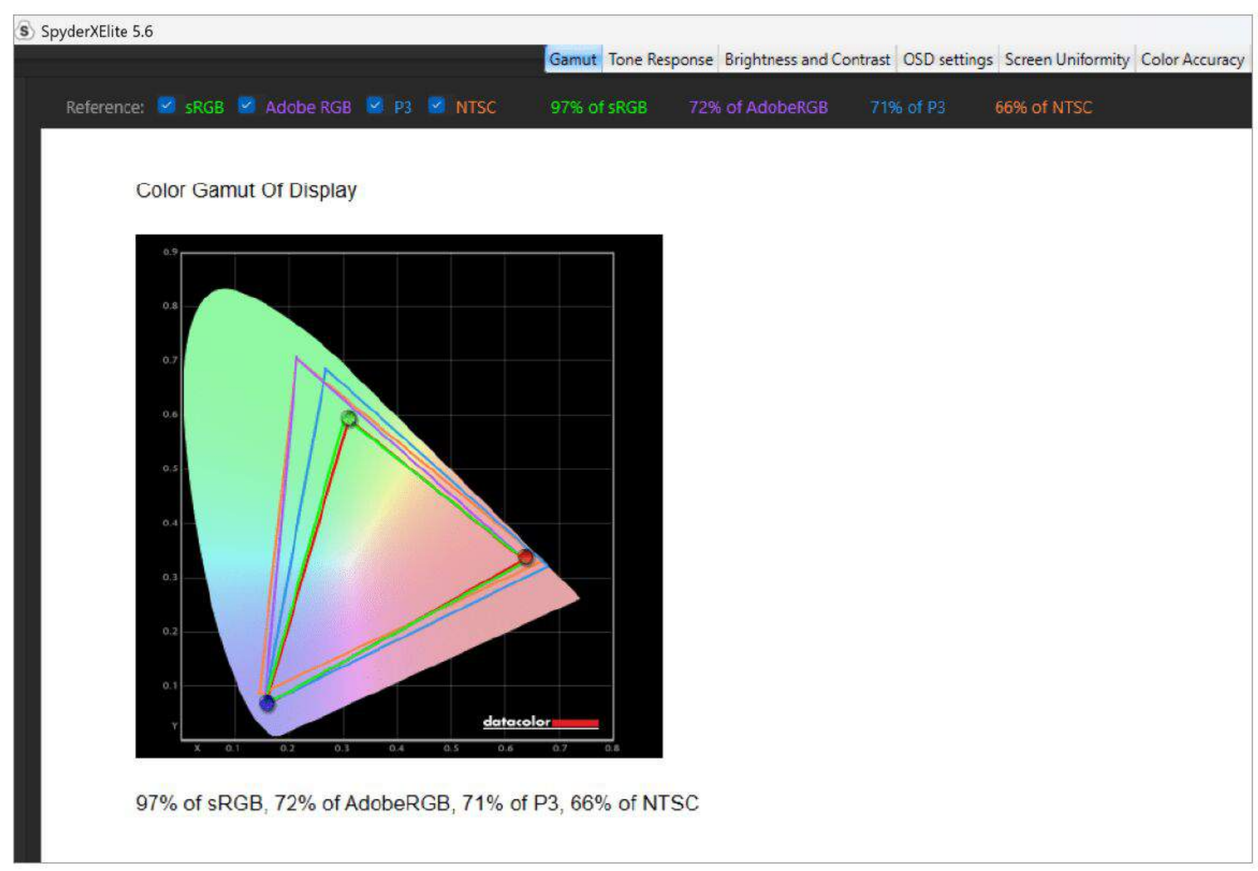
The Surface Pro 9 (front) versus the Surface Pro (2024) (rear).

The other thing that's annoying is that the panel itself is obscured by the rounded corners of the display, similar to the Surface Laptop Studio. Again, that's not really noticeable. But if you're taking a screenshot or screen snip, for example, you'll notice the corners "disappear" into the display. The entirety of the screenshot appears to be saved, though, and I didn't notice any UI elements that were obscured by the rounded corners. "When measured as a standard rectangular shape, the screen is 13 inches diagonally (actual viewable area is less)," Microsoft notes (fave.co/4cX41hy).

The OLED display does put out 529 nits of luminance, however. It does not carry any HDR ratings outside of Dolby Vision IQ, which is now present on all of the new Surface Pros. Dolby IQ adjusts HDR picture quality to suit the ambient light and content on the display, and these can be tweaked inside the Windows Settings menu.

The display is super reflective, as you can see from the photos in this article. You might yearn for a matte coating. But how quickly we take for granted the 120Hz screen!

The Surface Pro (2024)'s supported color gamut is worse than the Surface Pro 9 (5G), fave.co/3ghcbtC, save for the increased support of the DCI-P3 color gamut—used for video editing and displaying HDR content. For me, that's a signal that the



The supported color gamut of the Surface Pro (2024) is worse than that of the Surface Pro 9 (5G), save for the increased support of the DCI-P3 color gamut.

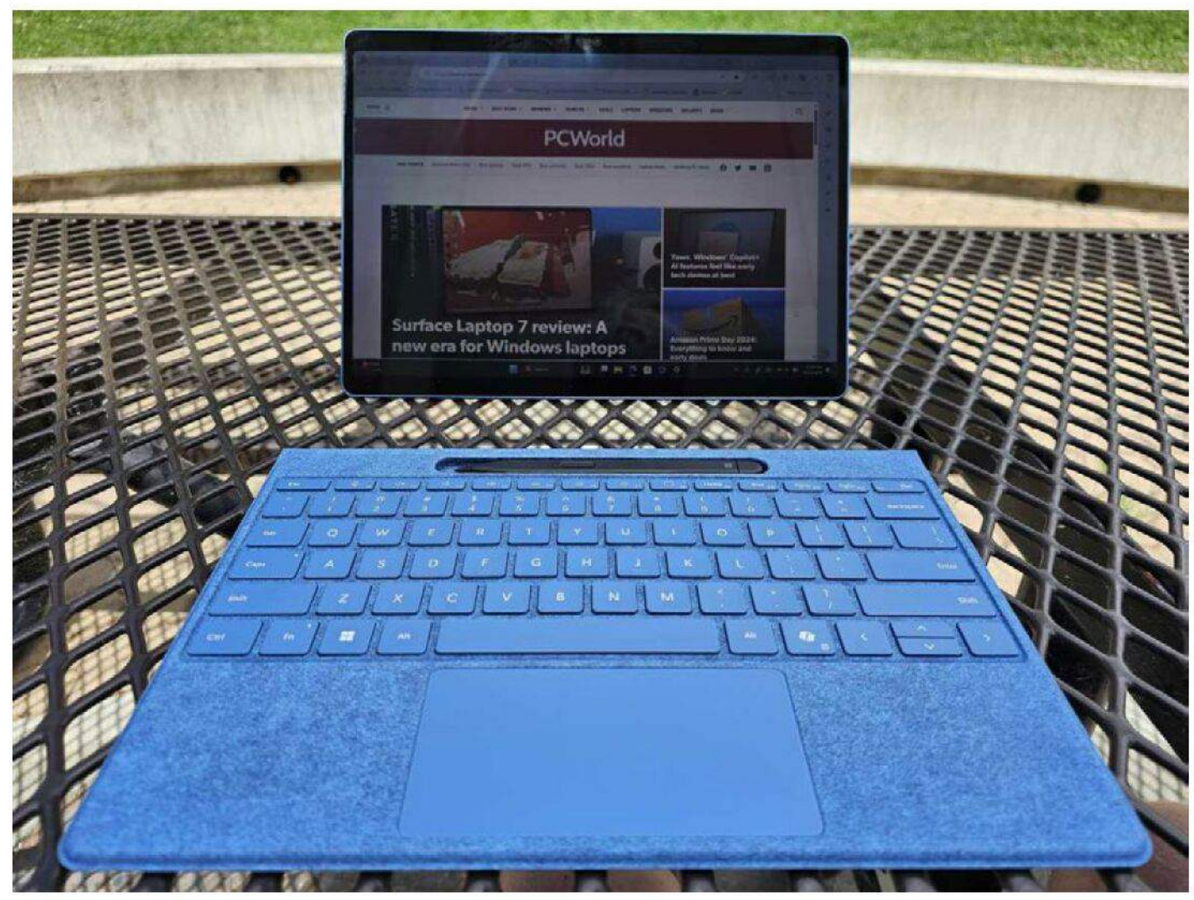
Surface Pro (2024) is more of a content-consumption device than ever before.

TYPING, TOUCHPAD, AND INKING EXPERIENCE

I didn't have a great out-of-the-box experience with the Surface Pro (2024) 11th Edition (fave.co/46lixOh), and the Flex Pro keyboard was a significant part of that. I'm used to tapping the space bar to wake up a PC. With the Surface Pro, the tablet itself could be awake, but it seemed like I needed to tap the space bar to *wake up the keyboard*. That, on top of the need to update the keyboard's firmware (?!), didn't get me off to a great start.

The keyboard just seemed to stop working occasionally, too. On one occasion, both the Flex Pro keyboard and the associated Slim Pen 2 disconnected from Bluetooth, causing me a flash of panic. Most Bluetooth keyboards include some button or switch to manually connect them in case they disconnect. This doesn't. In the case of the Flex Pro, just clicking in the keyboard caused it to pair again, fortunately. Double-clicking the top of the Pen caused it to connect, too.

But the Bluetooth-connected Flex Pro keyboard does work, and works pretty well. A laptop keyboard feels rigid, and I honestly prefer one. The Flex Pro keyboard, while docked, has a decent amount of bounce and feels somewhat cramped. But even separating the keyboard by a few inches from the tablet gives it a sense of freedom it lacked before. It absolutely solves the "lapability" problem, too—no longer do you need to balance the tablet and its kickstand on your lap. Instead, you can type on your lap while putting the tablet separately on a tray table. (I didn't have enough time to make an Amtrak trip, as I have done before with the Surface Go, fave.co/4bKT69Q.)



This photo shows off the detached Flex Pro keyboard but also indicates what it's like to use the Surface Pro (2024) outside. The display doesn't put out enough light with the OLED display to be useful in full sun, but in shade it's just fine.

The Flex Pro hinge folds down, allowing you to flip it underneath and elevate the keyboard angle a bit. It works pretty well, and my typing was decent on the detached keyboard.

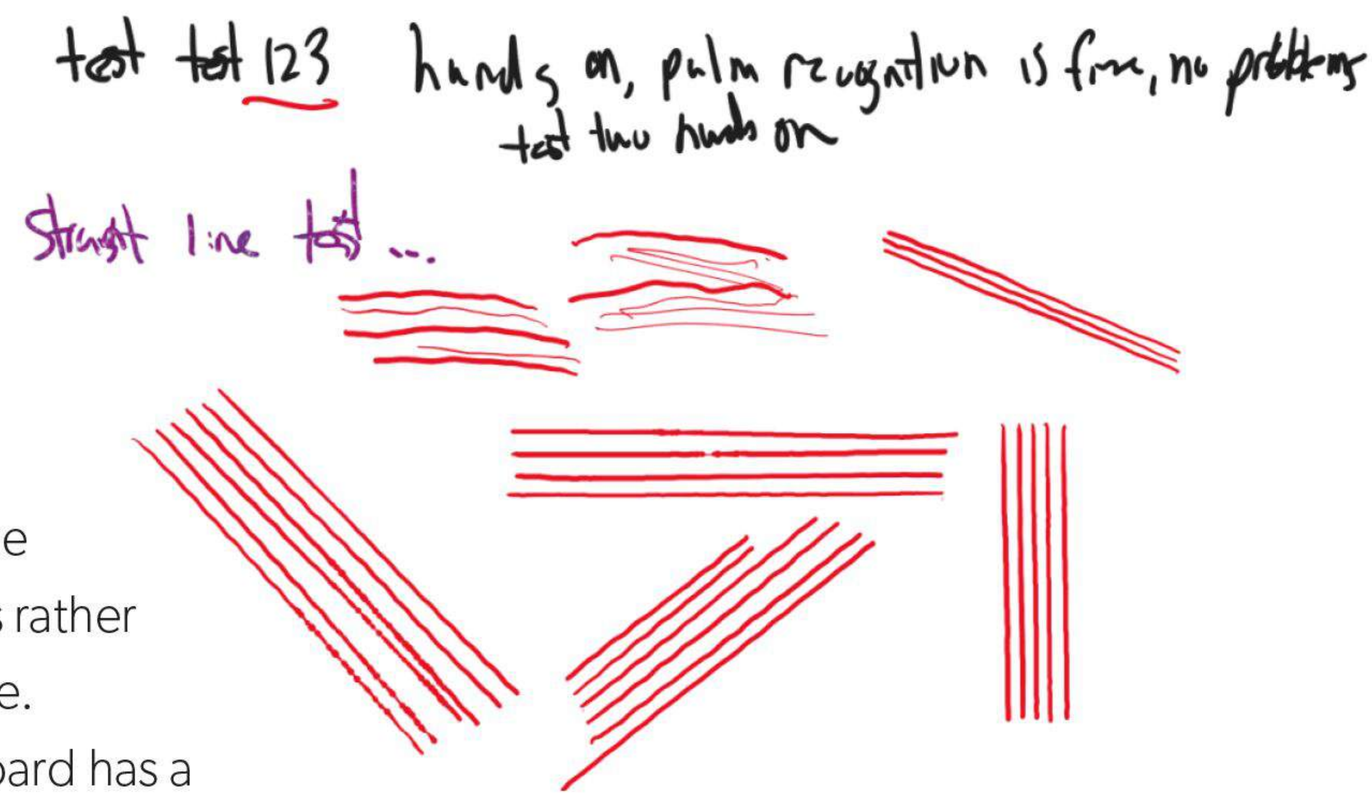
The Microsoft Flex Pro keyboard for the Surface Pro (2024) 11th Edition, with the included Slim Pen 2.

The weird thing is that the Bluetooth connection allows the keyboard to be placed a tremendous distance away—a dozen feet in my living room and probably more. That's well beyond the useful range of the keyboard and screen. Wireless makes for a lovely addition, but does feel a bit like overkill.

As for the Copilot key—all it does is launch a generic old Copilot app that floats around the screen like any other app. It feels rather anticlimactic, after all that AI hype.

Microsoft says that the keyboard has a battery life of 41 hours. From what I've seen, it will recharge when the keyboard is connected and when the tablet is connected to power. The Flex Pro keyboard doesn't seem to recharge when the tablet is on battery and doesn't serve as a reserve battery for the tablet, like the Microsoft Surface Book.

The Flex Pro keyboard ships with a haptic touchpad, which simulates the actual physical click of a touchpad. It's wider than the previous Surface Pro Signature keyboards, too—4.5 inches versus 4.0 inches. When the keyboard is "off" or in standby mode, the haptic keyboard shuts down too, which is a bit disconcerting. And sometimes it just glitches, as when I ran a test, and then the keyboard suddenly shut off without warning.



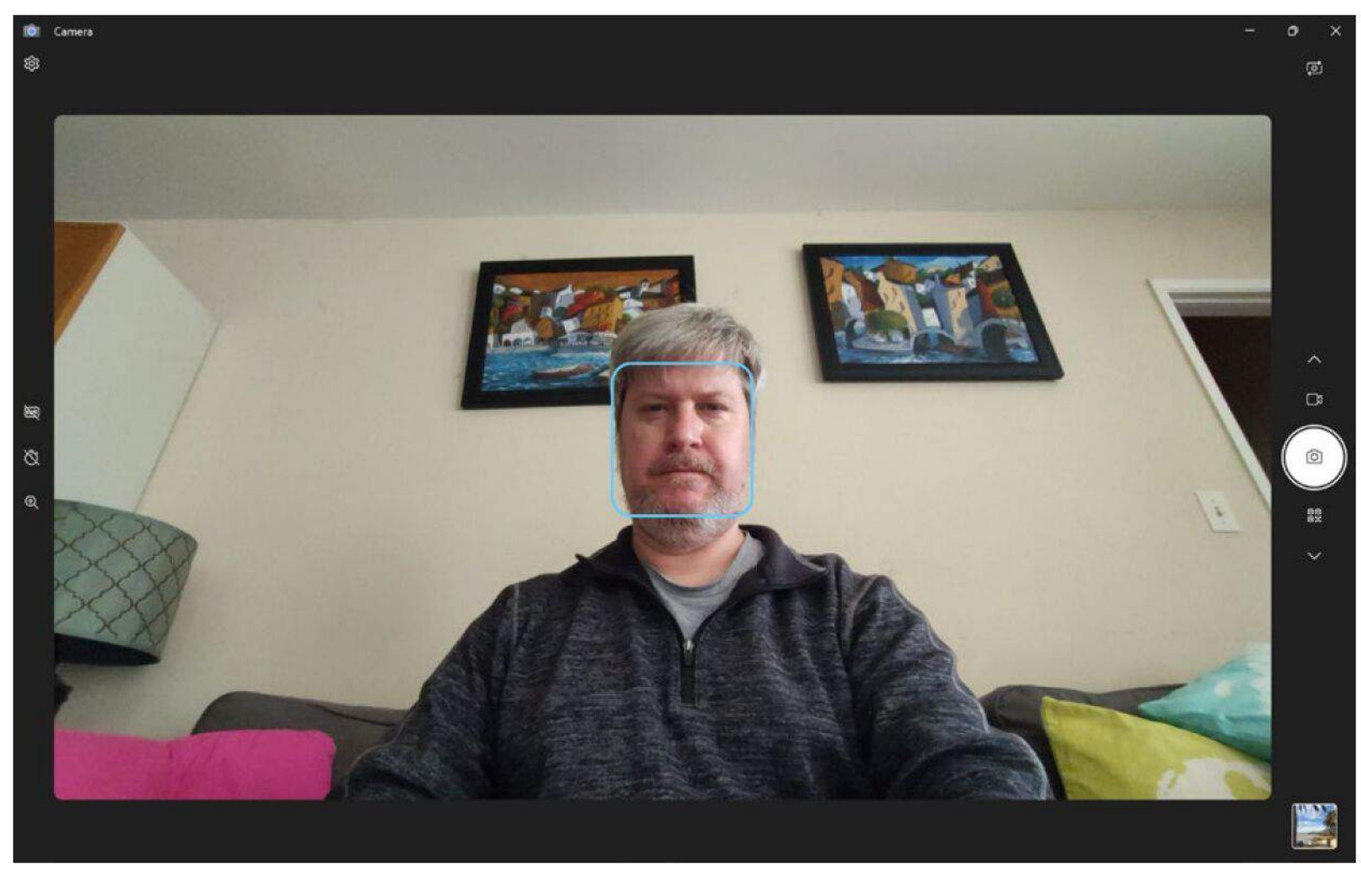
Inking on the Surface Pro (2024) 11th Edition. The lines in the bottom half of the screen were drawn with a straight edge. It's all helped by the 120Hz screen.

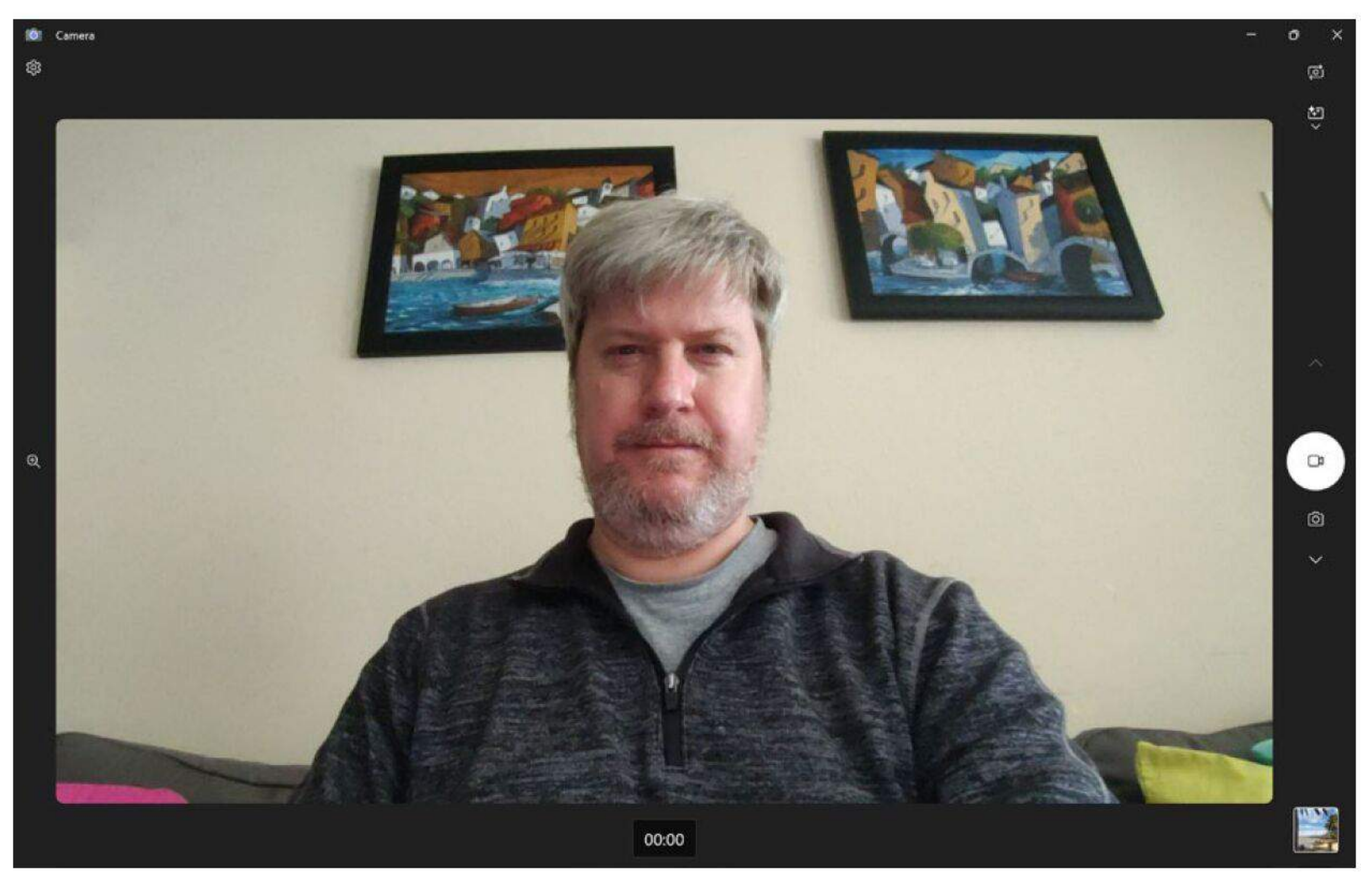
I really do like how the Surface Slim Pen 2 interacts with the Surface Pro's digitizer, though. Inking is probably the best I've seen on a Surface device, based on my example lines below. I look to see how closely the ink "flows" from the physical tip of the pen (perfectly, from what I see), and whether there's any judder or wobble as I draw a straight line with a ruler. The tell is the diagonals, where you see the most wobble. Here, though, there's really not much at all.

As with other recent Surface pens, the Slim Pen 2 recharges in its cubby, which is now always exposed in what Microsoft says is a bid to make it always apparent and accessible to the user.

WEBCAM AND AUDIO

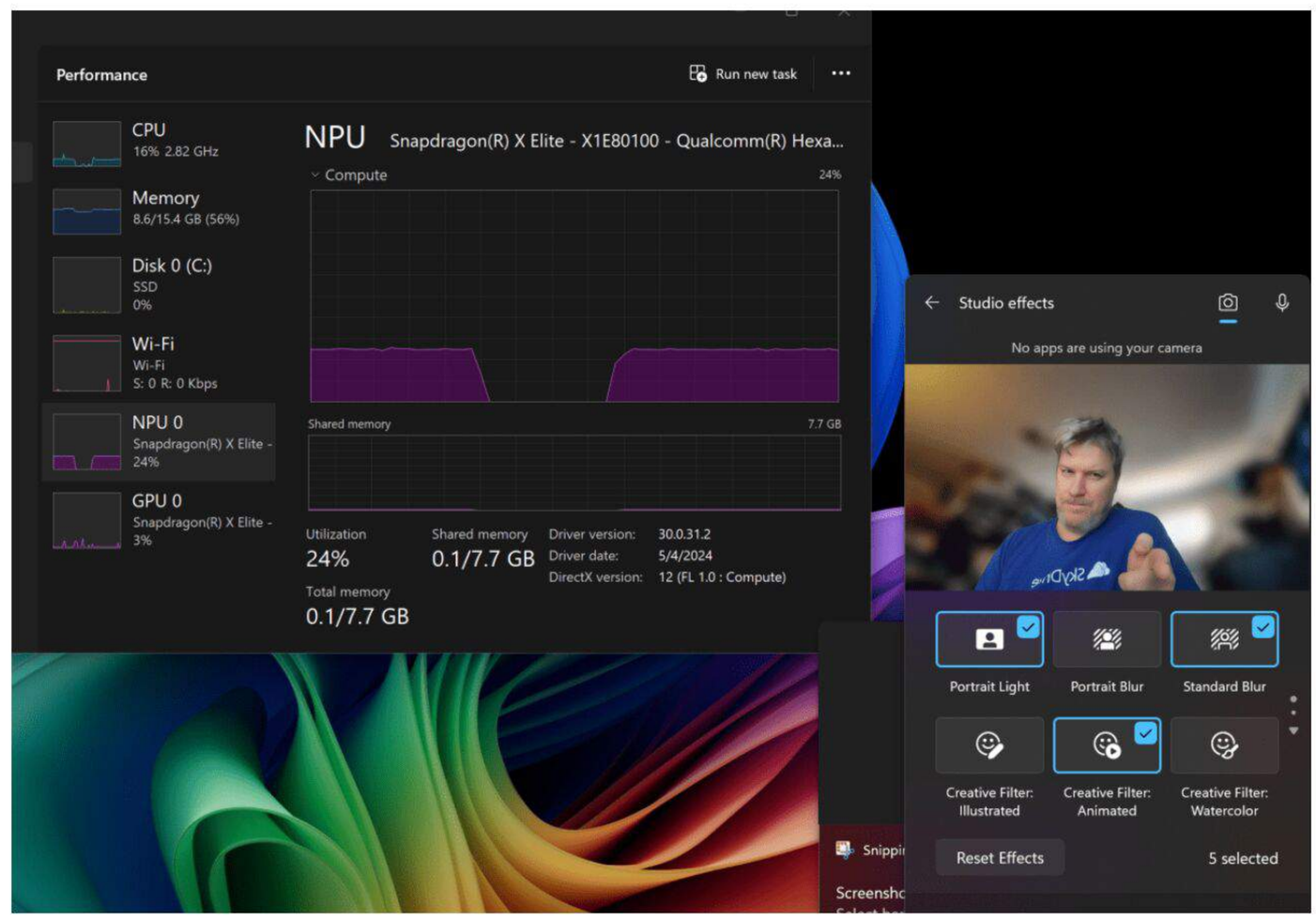
The Surface Pro (2024) 11th Edition seems to include the same 2W speakers as its predecessor. Surfaces have had a reputation for powerful audio, and this new Surface lives up to it. My early impressions were that the sound became muddy as the volume climbed, but after spending more time with the tablet, I've rescinded that. It seems pretty clear, up and down. The tablet does ship with Dolby Atmos for Speakers that's on by default, though, so that certainly contributes positively.





The Surface Pro (2024) includes an ultrawide 1440p webcam, which I dislike; it's just too wide for a single-person perspective. But in video, turning on the Windows Studio Effects' Automatic Framing allows the camera to zoom in, plus add additional effects.

The tablet also ships with a 1440p front-facing webcam as well as a 10Mpixel rear-facing webcam. Microsoft has invested in exemplary webcam experiences, especially with some of the Windows Studio Effects AI features I'll talk about in a bit. This webcam is excellent, easily the equal and then some of the best webcams (fave.co/3LZ3Gjk) I've reviewed: sharp, clear, great color, and intelligently focusing and exposing the camera for your face rather than the background. I almost think that it does a better job of lighting your face in a dark room, lit by just the tablet itself, than it does with this moderately lit shot above.



Turning on all available Windows Studio Effects options (some are choices between multiple options) doesn't max out the Snapdragon X Elite's 45 TOPS NPU.

With Cortana essentially dead, there's no need to test the mic pickup across the room. But the AI noise filtering is excellent, slightly below what the Asus ZenBook 14's AI audio filters (fave.co/3TqSoHu) delivered. The filters slightly picked up the lead vocals from a rock song, but absolutely filtered out a background white noise track of rainfall that I played at loud volume right to the side of the notebook. Terrific work here.

AI EXPERIENCES WITHIN WINDOWS

There's a problem, which I'll use as a transition point to talking about some of the Surface Pro (2024)'s AI app experiences: a lack of available AI testing apps for NPUs. UL's Procyon app includes a vision AI test, which evaluates the AI performance. Both that test plus Geekbench ML, which also promises to evaluate AI performance, would only run on the CPU. I also couldn't find any generative AI applications that would run on Arm, let alone take advantage of the NPU. So Qualcomm's vaunted NPU really isn't put to good use inside the Surface Pro (2024) from a third-party app perspective.

Microsoft would probably vehemently disagree with that, of course, as there are

several Windows applications that now use AI. (Again, I don't think most users will care whether they use the CPU, the NPU, or the cloud, but I'll note what I noticed anyway).

And yes, Recall is on hold. So one of the flagship features of this tablet is gone. Poof!

Microsoft has a few new Studio Effects, subtle improvements that may matter to you if you're on a lot of video calls. The older Studio Effects replicated functions in Zoom, Teams, or Google Meet: background blurring and audio filtering. Eye Contact made it seem as if you were staring at the camera at all times. Automatic framing centers you in the picture by using cropping effects. Those all existed before the Surface Pro.

The most useful addition is a teleprompter addition to Eye Contact, so if you're reading text from a screen during a call, you'll still seem like you're focused in on the listener. Several Creative Filters (Illustrated, Animated, Watercolor) don't do anything and are useless. And a new Portrait Light addition to make me look "natural" just yellowed out my screen. They all use the NPU. Interestingly, using as many Studio Effects as I could simultaneously didn't go over 25 percent of the available NPU resources.

The application that Microsoft is pushing people to use most seems to be the dual generative AI functions in Paint, which use the NPU and the optional-but-not-really Surface Slim Pen 2: Image Creator and Cocreator (fave.co/3Vj3Ifn). Image Creator (formerly called Cocreator, too [fave.co/3y57vzF]—don't ask) is Microsoft's generative AI service, and it uses the cloud to deliver really wonderful 1152×1152 images.

The new Cocreator is part of Paint, but a separate function from Image Creator—it doesn't have to be, but it is. Cocreator is essentially the same as Image Creator, but it

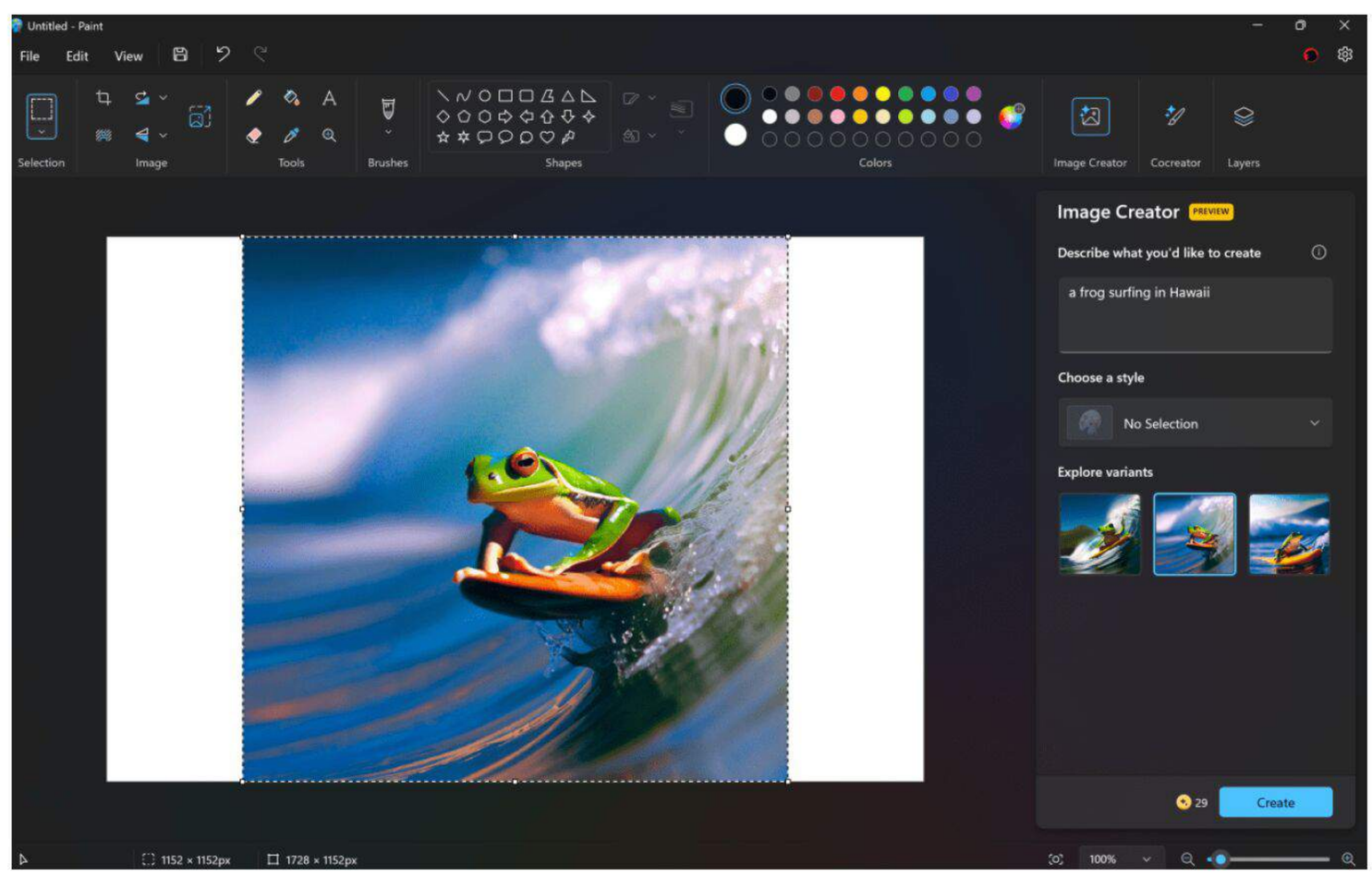
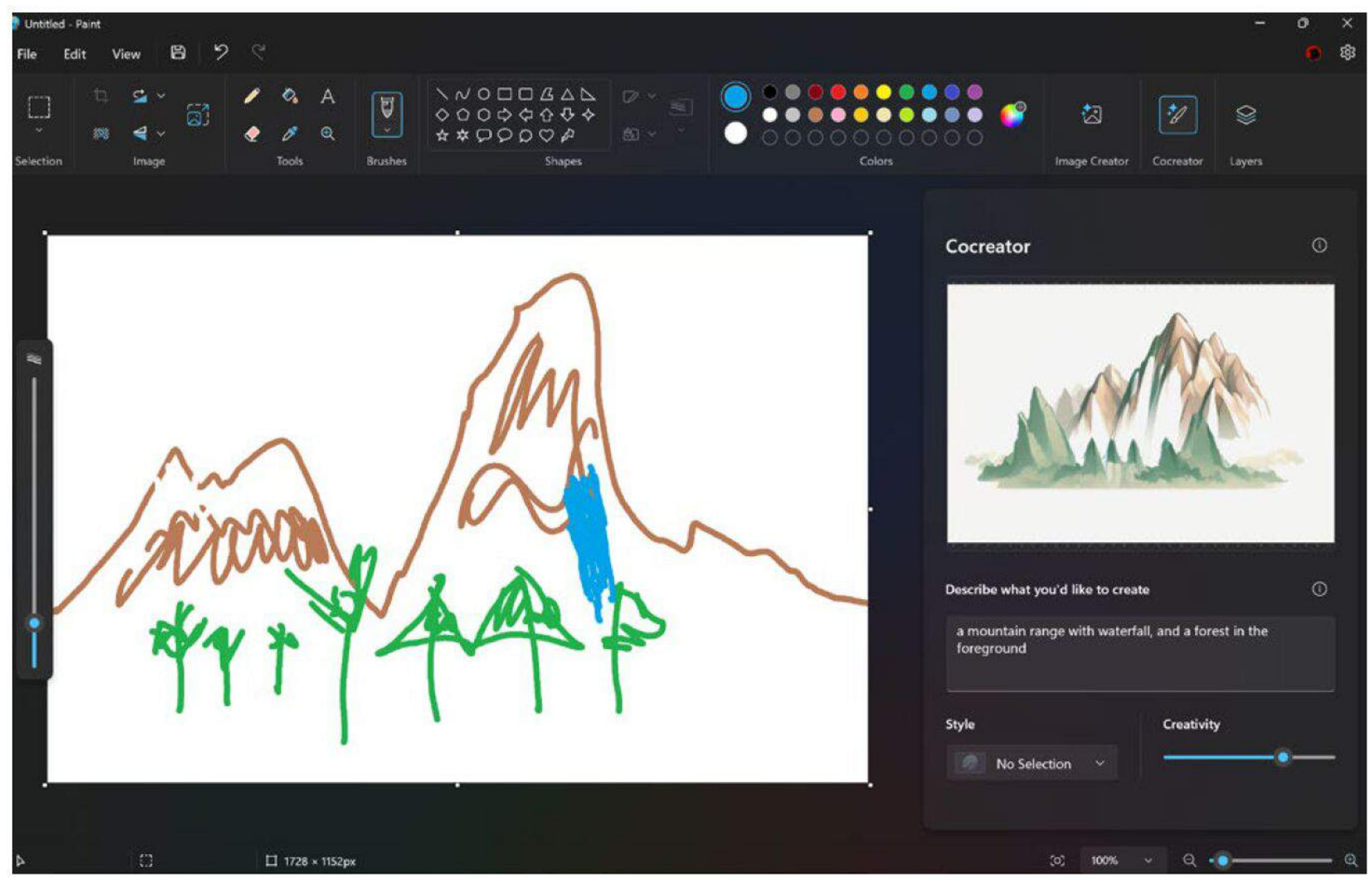
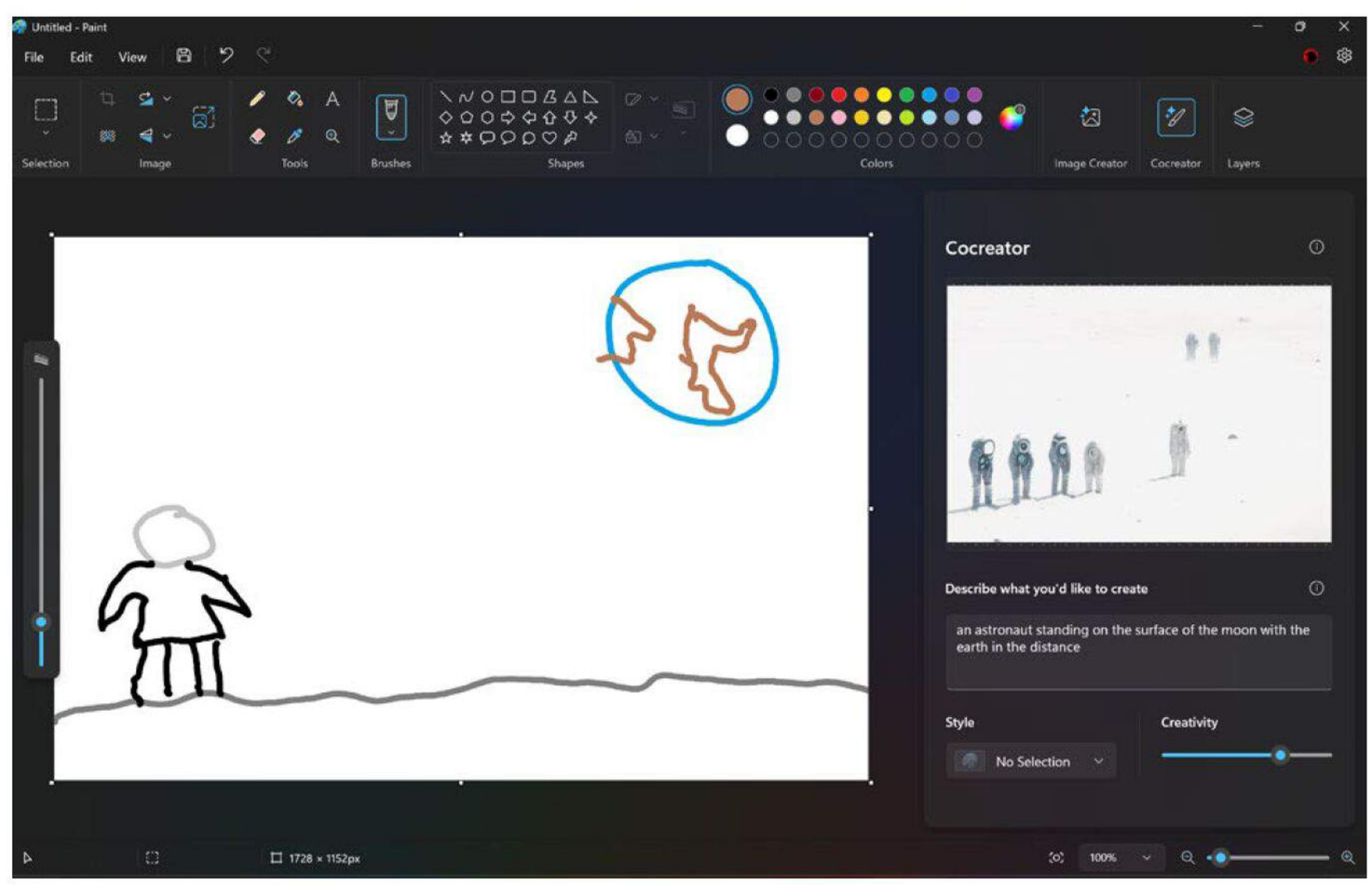


Image Creator is still pretty standard AI art, but it looks nice. I still don't know what, if anything, the little "29" token counter signifies, although I asked.

uses your pen input as guidance to create the image. It's hit or miss. You can sketch out what you want, and then add the prompt, with an adjustable "creativity" slider that allows Cocreator some leeway. But it's more fun when you enter the prompt, then sketch out what you want, and Cocreator responds in real time. You don't get the photorealism that Image Creator offers, but you have more control over the final output.

Cocreator seems to work best when it understands what you draw. It did pretty great with my awful drawing and prompt of a mountain range and forest. But it completely whiffed on a sketch of an astronaut standing on the moon's surface with the Earth in the background.





Two attempts by Paint Cocreator on the Surface Pro (2024).

Live Captions are more useful than I thought they'd be. They not only caption any video you have (like a video of a wedding or graduation, say) but they will also translate any audio—whether that's on the screen or via the tablet microphone. Just make sure you enable that in the app's settings.

The kicker? These AI art apps need to be connected so that Microsoft can vet your images for, well, inappropriate things. It

sort of defeats the whole purpose of a local NPU, right?

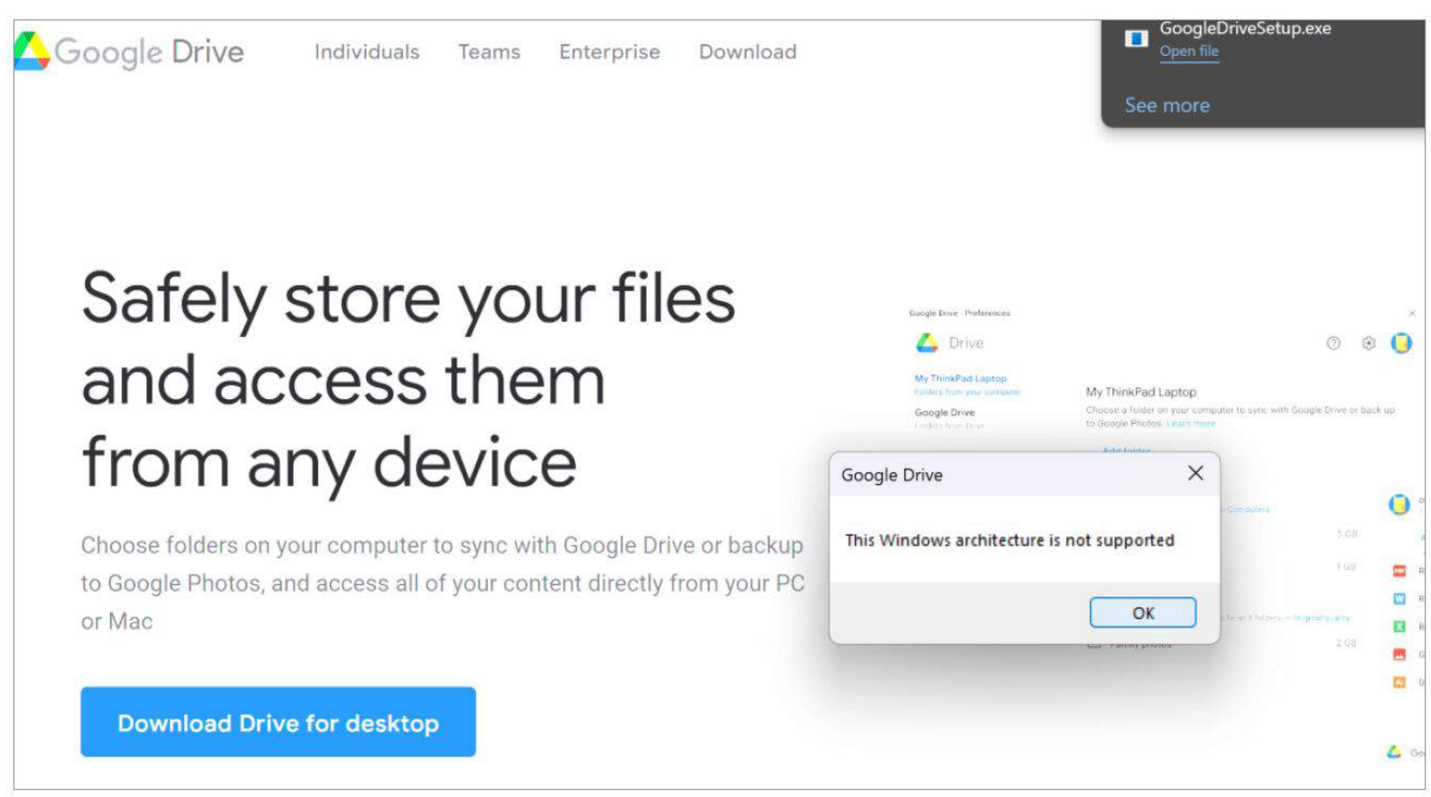
THE WINDOWS ON ARM APPS ISSUE

Using a Windows on Arm PC in 2024 still reminds me of a Chromebook: Many, many, apps and functions just work via the Arm chip on the Surface Pro (2024), but some do not. To save time and space, I wrote about my experiences trying a number of apps on the Surface Pro (fave.co/3zDBwau) in a separate story. There's a lot! Browsers, especially, are coded for Arm, but even the notoriously slow Slack app runs in Arm. Still, readers took to the Internet to complain about two functions that they felt were lacking: the lack of support for Google Drive and problems connecting to Brother printers.

There are several issues here. First is whether you'll be simply able to do something. Microsoft is already working to eliminate third-party printer drivers (fave.co/3W6HckC), preferring its own native IPP drivers instead. So in the case of the Brother printer, I thought I'd be able to print a page, just as you'd expect. Nope. Oddly, I was able to scan with my Brother printer, but not print, even after downloading drivers. I had no luck at all with an older HP LaserJet multifunction printer.

But specific third-party utilities, such as those that accompanied older printers that you probably own, probably won't work. Certain assistant apps such as Razer Axon won't either. Fun story: Just plugging in a Razer USB-C hub, which usually auto-downloads Razer software, caused the Surface Pro to crash, reboot, then show a black screen until I removed the hub. But Razer Synapse and Cortex work in Arm. I gave up on installing Logitech Options, which helps control mice and keyboards, after about fifteen minutes of inactivity.

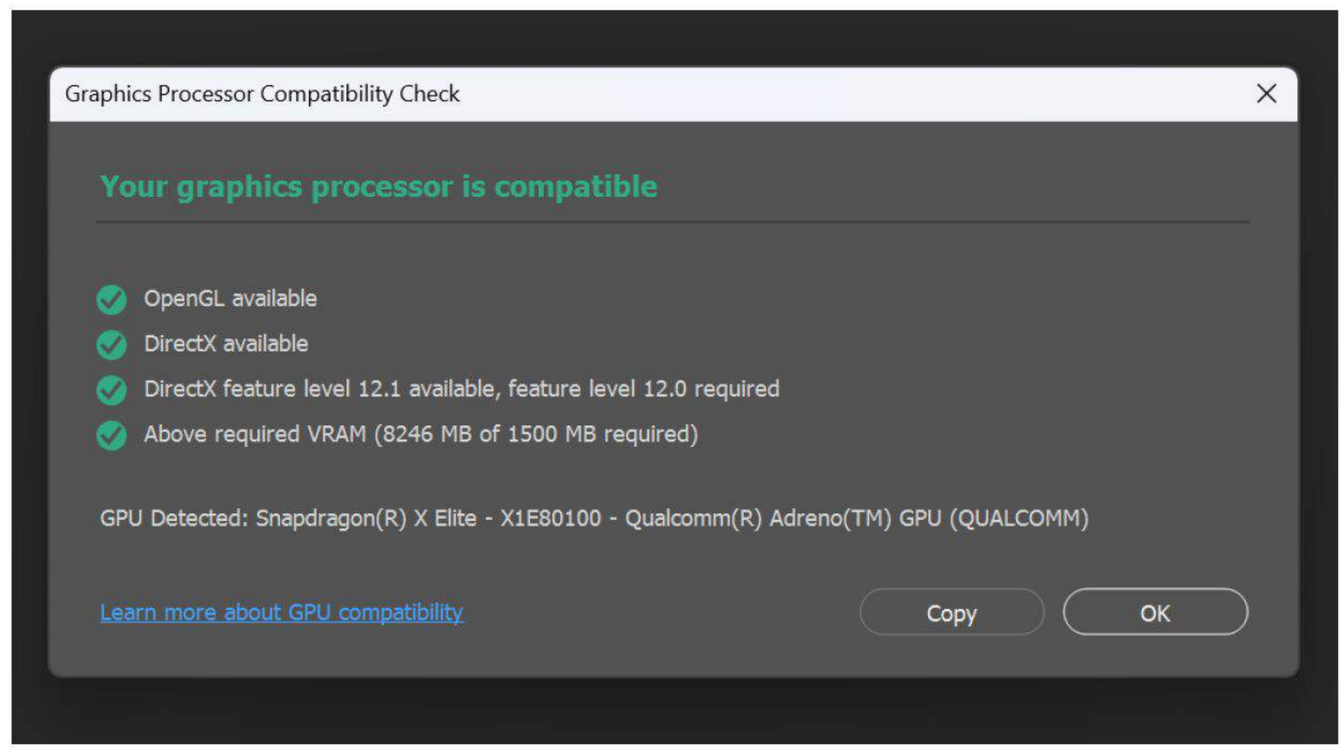
Most of the *apps* I tried in my accompanying article ran just fine. But I couldn't try everything, and certain VPNs (Nord, for example) didn't work while others did. The other concern—whether manufacturers will write software drivers for older hardware that connects to Arm PCs—is



Geez, Google, at least let the Prism emulator try…

just too big to address here. Basically, if those functions can be included in Windows like printing, you'll be fine. A driver for some piece of purpose-built hardware released five years ago? I'd doubt it.

Keep in mind that Web apps can step in, too. People complained online that Google Drive's app doesn't run on Arm. It doesn't. But the Web app can step in for some of that functionality and works well.



Photoshop likes the Snapdragon X Elite and its Adreno GPU.

The second issue is simply how well those apps will run, if at all. Microsoft developed an emulator called Prism that is supposed to step in and emulate an app not written specifically for Arm. In practice, several apps—including some testing apps—simply refused to run if it detected an Arm chip, or generated some other error. That's supposedly the developer's fault, we're told. That really doesn't matter when it doesn't work. We ran into that with some of our testing apps, which didn't work or generated errors. Ditto for Google Drive.

As I found, a number of productivity applications already have native applications written for Arm, and that matters. Adobe Photoshop, for example, is written natively in Arm. Lightroom is as well. In Photoshop, at least, the features found in both the X86 and Arm apps appear to be identical. Other Adobe applications are on their way. (Adobe Lightroom connects to the cloud and runs natively on Arm, and Lightroom Classic runs, according to my colleague Gordon Mah Ung, only via emulation but runs well.)

Photoshop's generative AI features still use the cloud and not the Snapdragon NPU, however. Frankly, I doubt you'll care how those AI functions are processed, just that they are.

If an app is not written to Arm and has to be emulated, the Surface Pro's CPU kicks into high gear. That's a problem. Take our Handbrake test, for example. The open-source codec does ship with an Arm version, but I used that as well as an older, unoptimized version for compatibility's sake.

The Surface Pro doesn't deal well with unoptimized apps. In Handbrake's case, the rear of the tablet became hot over the duration of the test, over 100 degrees Fahrenheit. (The new Arm-powered Surface Laptop, reviewed

by a colleague, soared to about 120 degrees). But the battery life plunged. I'll talk more about that in the next section.

As for games? Nah. I saw the Snapdragon X Elite running *Baldur's Gate 3* at 30 frames per second at Low detail settings. As I detailed in my other story, I tried *Saints' Row IV* and an older, simple 3D top-down shoot-'em-up. The latter ran, the first didn't. I'm not going to kill myself trying dozens of games when Microsoft has already told us that the Surface Pro (2024) isn't a gaming machine (fave.co/3Y2oyNC).

HOW FAST IS IT?

All that leads us to the performance of the Surface Pro (2024) 11th Edition. I leaned on our familiar benchmarks, trying to quantify some of what I had anecdotally experienced above. But I tested in three modes: plugged into the wall, as you would normally use the tablet, on battery, and dialing up the Windows power slider to maximum settings. On some tests I experienced little changes. On others, the difference was more profound.

For better or for worse, we don't have too many rivals to Qualcomm's Snapdragon X Elite processor. With Intel, I had but a single Core Ultra (Meteor Lake) laptop on hand and no tablets—Microsoft wasn't exactly rushing to send the Surface Pro 11 with Meteor Lake inside. So instead my colleague Adam Murray sent me a Meteor Lake X1 tablet from OneXPlayer. I also used the Asus ZenBook 14 OLED with a Meteor Lake chip inside. Finally, I compared it to the Surface Pro 9 (5G) with a Microsoft SQ3/Qualcomm Snapdragon 8cx Gen 3 chip inside for a generation-over-generation comparison.

We're not making explicit comparisons to the Apple MacBook, though our Macworld colleagues' review of the Apple M3 MacBook Air (fave.co/3XYOD01) does allow for some comparisons. We'll note those where appropriate. We're trying to give you a representative idea of the Surface Pro's performance rather than establish which Windows on Arm tablet is the best of the bunch.

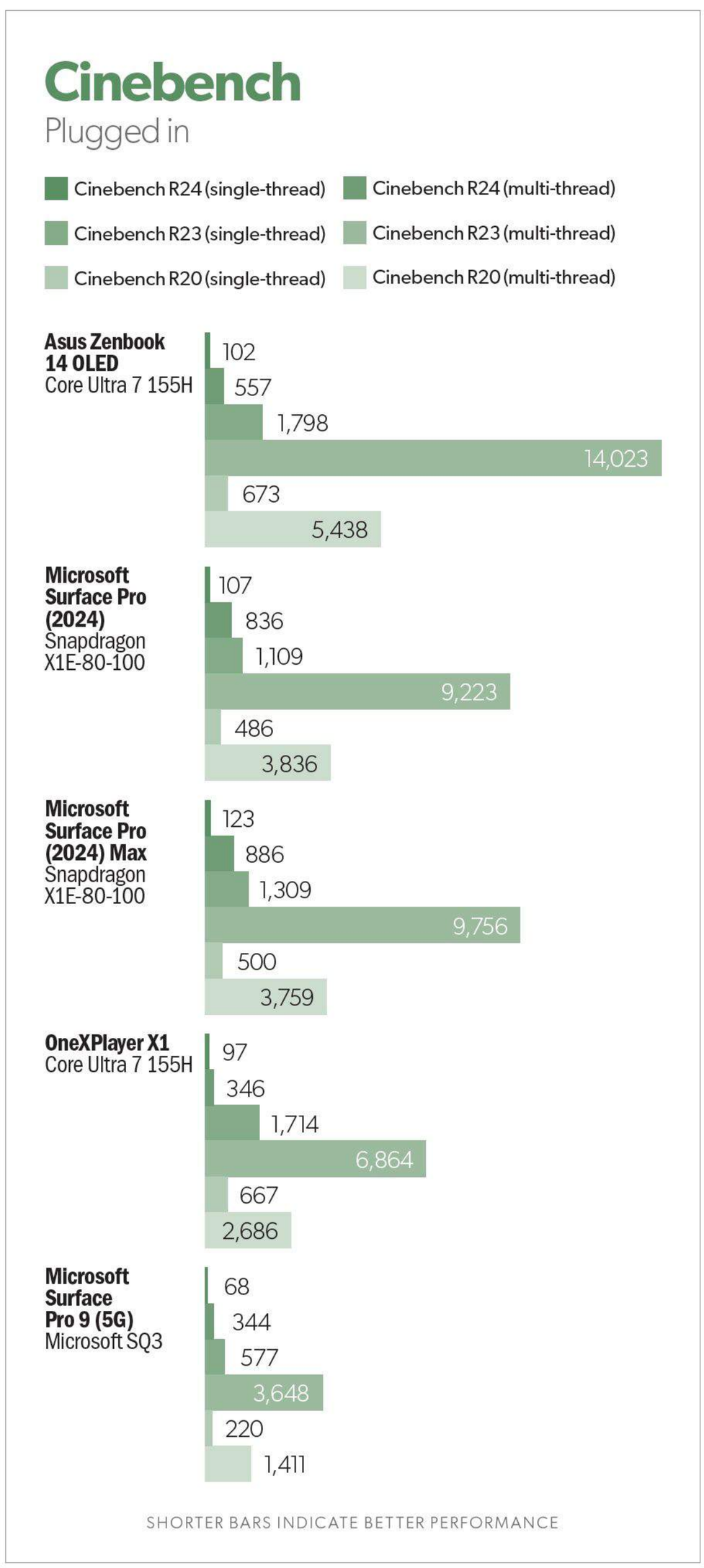
I used a selection of tests: Cinebench, which measures how fast a laptop's CPU chews through a rendering task, and Handbrake, which does the same over a prolonged period. I added the popular Geekbench test, too. The PCMark Apps test calculates the time it takes to perform standard Microsoft Office and Web browsing tasks. 3DMark (both Time Spy and Night Raid) measure how well the Snapdragon X Elite's Adreno GPU fares. I also added PugetBench's Photoshop benchmark to try and add a more intensive workload. And finally, I used Procyon's AI Vision test to try and measure the chip's AI capabilities.

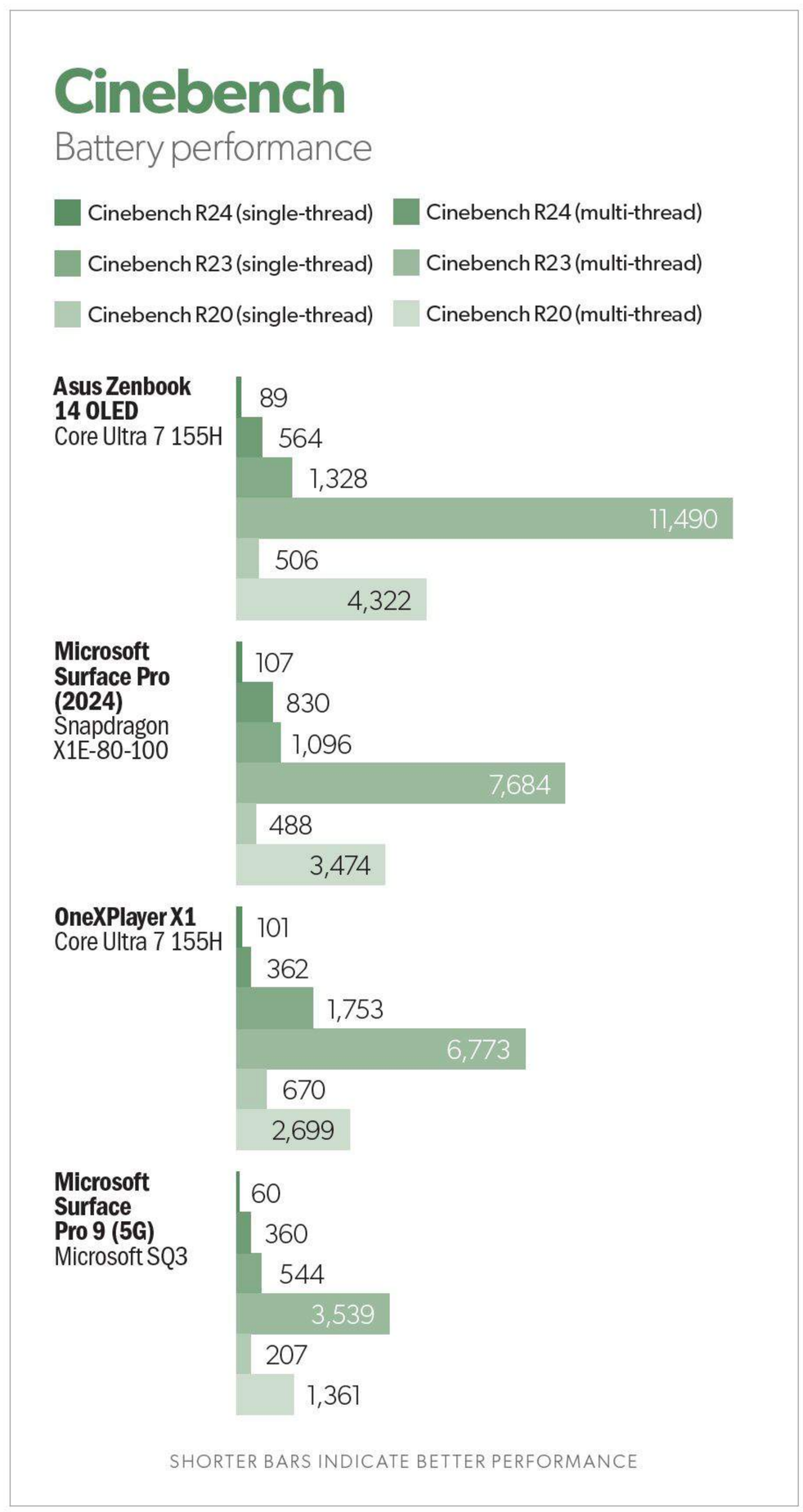
But there were wrinkles. Though PCMark 10's Apps test ran, PCMark's conventional tests did not. (Weirdly, PCMark didn't run on the Asus notebook either.) Procyon's AI test usually offers the choice of the CPU, GPU, or

NPU to test the AI capabilities. But only the CPU test was offered by the app, and Underwriter Labs, the developer, didn't provide an alternative. AI art apps besides say, Cocreator, don't really use the NPU. So yes—Qualcomm's vaunted AI TOPS wasn't put to the test.

That just underscores some of the compatibility issues Windows on Arm still has, and you can see why some think these early "AI apps" within Windows are just tech demos (fave.co/4f3NQkw).

Cinebench accommodates both X86 and Arm, though the most recent R24 (2024)





release includes a dedicated Arm version that the earlier versions lacked. The Surface Pro, with its 10 performance cores, won in the most recent R24 release. Intel's Core Ultra does well on the older versions.

So far, the Surface Pro more than holds its own against the Windows tablet, losing to the Asus notebook. Note the inclusion of the Max entry. That's where I dialed up the Windows 11 performance slider, up two notches from its most conservative Recommended setting. There's a small but notable difference in some tests.

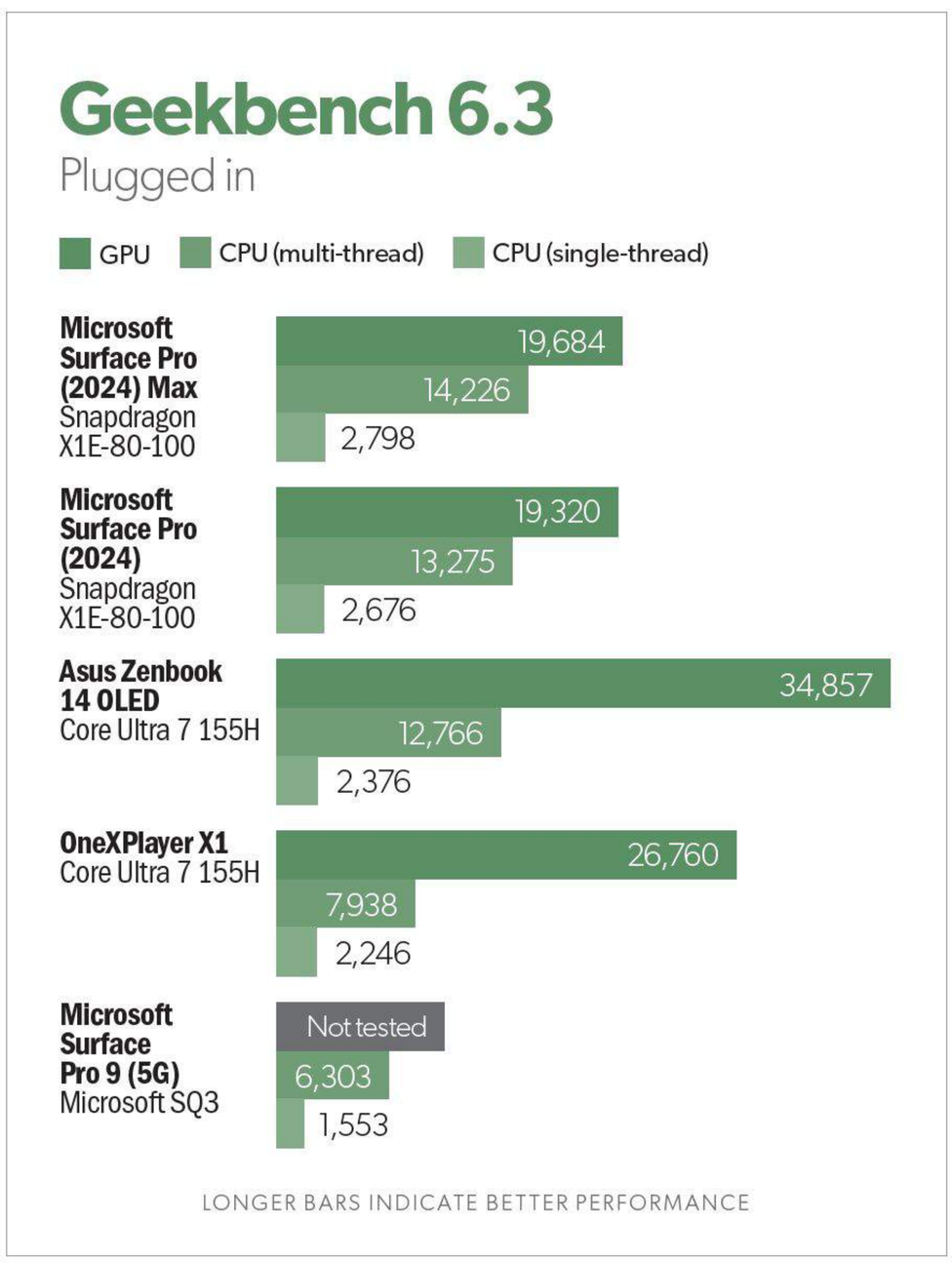
For comparison: The 15-inch M3 MacBook Air reports a Cinebench 2024/R24 score of 658 in multicore and 141 in single-core performance, according to Macworld. The Surface Pro (2024) is faster.

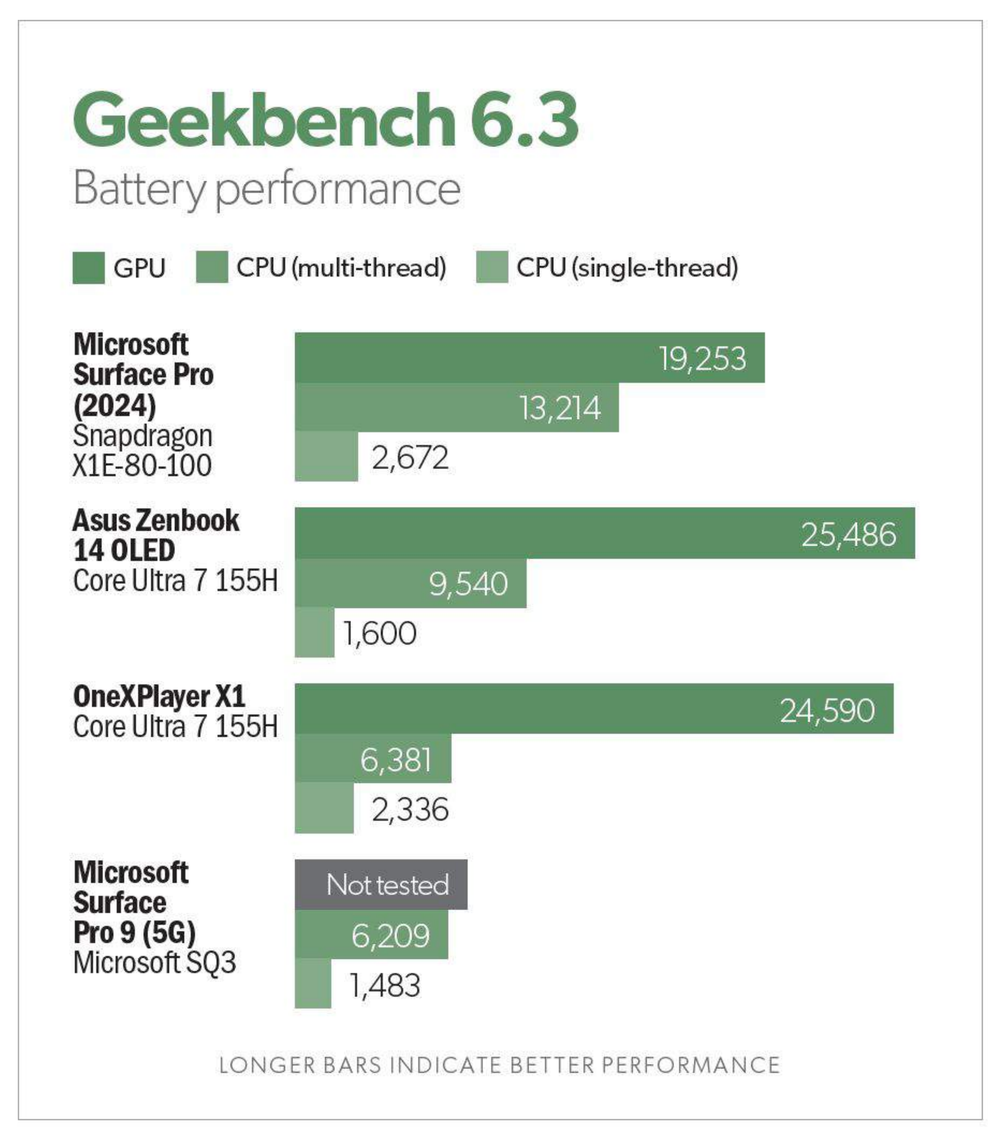
Now, let's look at how the Surface Pro fares against the other competitors in terms of performance, when the tablet is just running on battery power. (I didn't run the tablet on maximum while on battery.)

We're seeing similar scores here, with drops across the board for the Snapdragon X Elite as well as the Core Ultra.

We typically don't use the quick and easy-to-run Geekbench test, but I did so here, just to add another layer of benchmarks.

This test uses both CPU and GPU benchmarks, which I again ran on battery power, wall power, and at maximum settings. I'll combine the two images together (one on battery power, one on wall power) for





brevity's sake. Again, remember that the max settings are only run on wall power.

Geekbench still loves the Adreno CPUs inside the Snapdragon X Elite, but gives the nod in GPU performance to the Core Ultra.

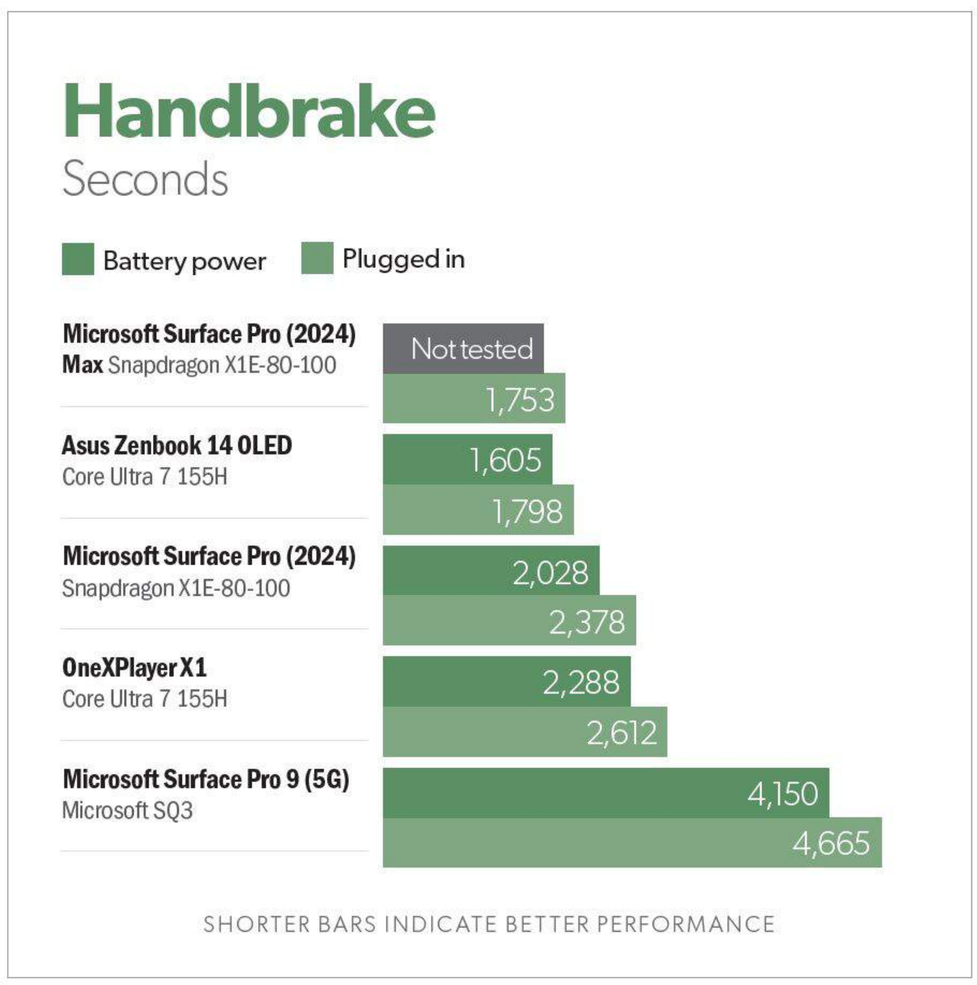
In Geekbench 6.2.2, which delivers performance results consistent with Geekbench 6.3, the 15-inch M3 MacBook Air scored 11,936 in the multicore test and 3,144 in the single-core test. It's a little closer here.

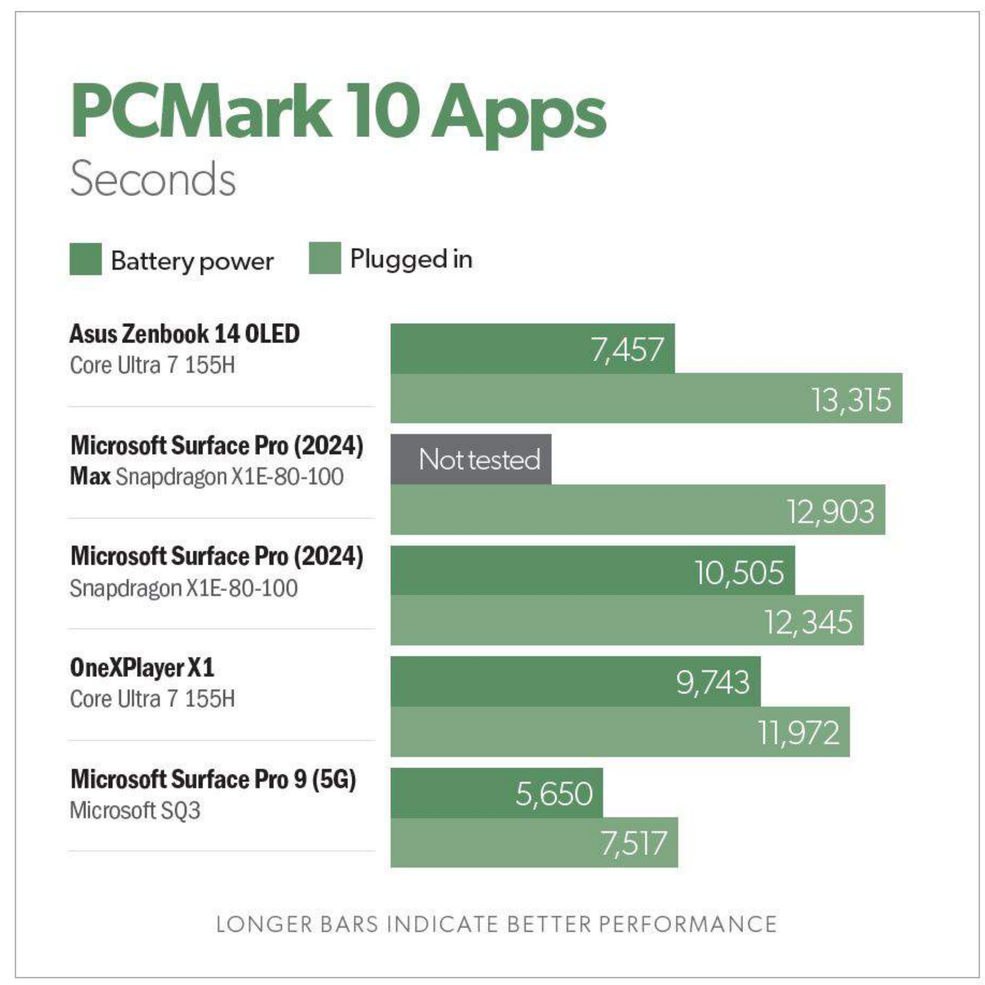
Let's move to Handbrake. Handbrake is a open-source transcoding test and we typically use an older version for compatibility's sake. We do so here, if only to show off the comparison to the other products. But wait! We also tested with an optimized Arm version.

There are two points to make here. First, no one will ever be totally satisfied with the available benchmarks. You either choose the latest one and toss out any comparisons you've made before, or you choose an older one and face howls of protest that your tests are unfair. Second, testing is a question of time as well as effort: testing on battery, on wall power, and on maximum settings is already time-intensive enough.

Scores on both battery and a plugged-in laptop are close to one another. As for the optimized Handbrake scores? It really didn't make an enormous difference. On the optimized Handbrake app, the Surface Pro (2024) recorded a time of 2,258 seconds, about 5 percent better than the unoptimized app. On battery, it was slightly slower: 2,278 seconds. On maximum settings, I recorded a score of 1,743 seconds, which is a dead heat.

We'll talk about the effects of unoptimized apps on the Surface Pro's battery-life results further below. Now, let's look at a more





practical test: PCMark Apps, which is a direct measure of how well the Surface Pro will fare in day-to-day office work and web browsing. Disappointingly, it wouldn't run the generic PCMark 10 test—application compatibility held it back.

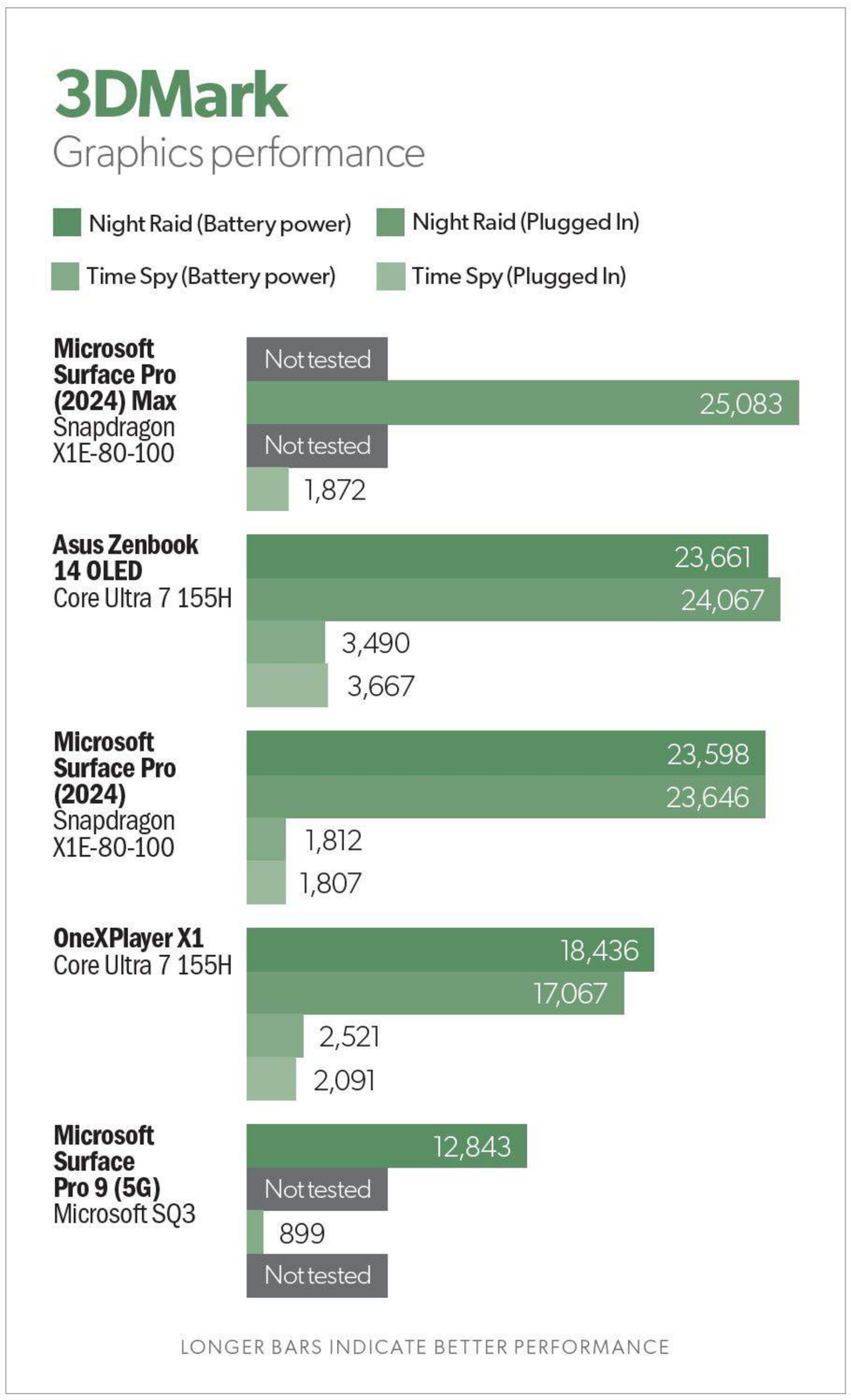
On battery power, it's an easy win for the Surface Pro (2024). On wall power, though, the Asus notebook is the best bet.

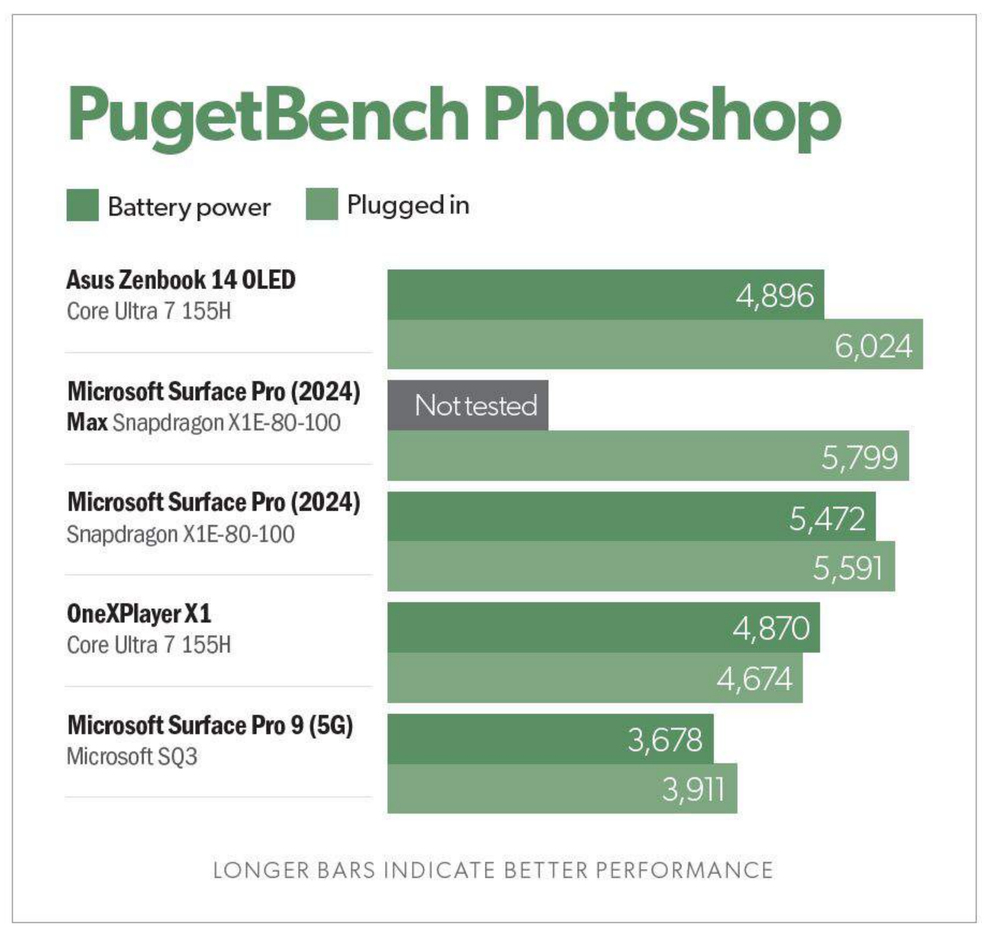
The problem with our graphics tests are that they really aren't too representative. Microsoft has said that the Surface Pro and Surface Laptop are productivity machines first, not gaming PCs. And there have been numerous reports from our reviews and reporters, plus across the Internet, that align with that statement. Games simply don't run on the Snapdragon X Elite as well as they do on X86 PCs.

Still, a GPU has more purposes than gameplay, as we'll see next.

Note the differences in 3DMark's tests. The cross-platform Night Raid test favors Arm while the more traditional Time Spy test used for our gaming notebook reviews leans toward the X86 processor from Intel. It's worth noting that 3DMark didn't even run until I downloaded the very latest benchmark direct from UL, on advice from Qualcomm.

Photoshop, however, is a nice practical tool to see how well the Surface Pro runs. PugetBench is a benchmark released





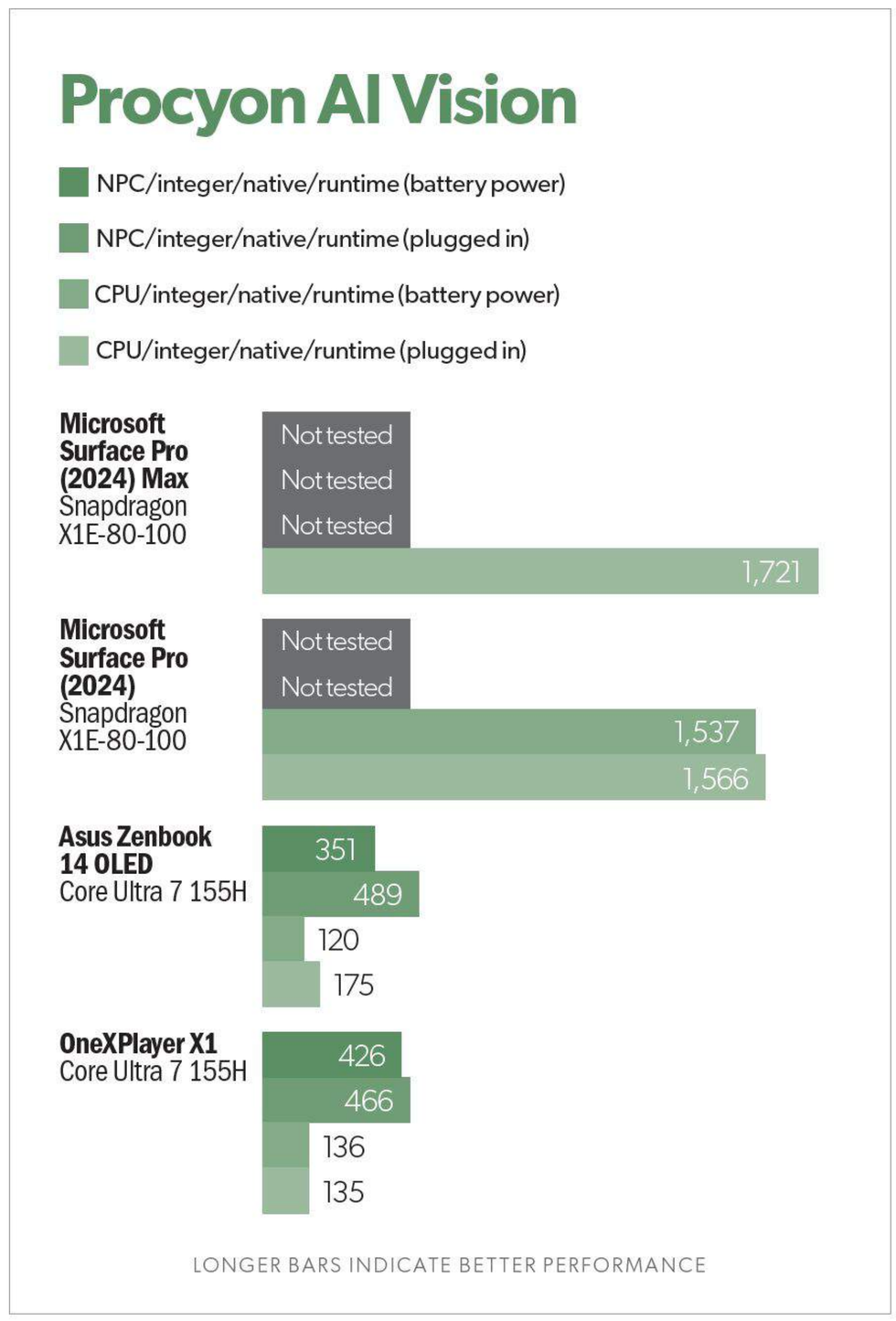
by Puget Systems, which directs Photoshop to perform various tasks. Since it depends on the version of Photoshop already on the laptop or tablet—and Photoshop has both an Arm as well as an X86 version—this is a nice test to compare the two platforms.

Again, the Snapdragon X Elite and Adreno GPU are holding their own, though the clamshell barely tops the tablet. If you thought that Arm wasn't suitable for creative work, you may have to think again. One question we haven't had answered yet is if we'll see an Arm chip paired with an Nvidia GPU…although we're hoping Nvidia answers that question in 2025.

Last but not least: AI. Again, this is a disappointment. We were hoping for some AI-on-AI competition, but the NPU tests didn't run on our systems. UL Procyon, which measures how well the chips process AI "machine vision" calculations, ran only on the CPU. But boy, did Qualcomm score a win here.

Normally, we'd close out our performance testing with some comparative battery-life tests. But I'm making a conscious decision not to, if only because I don't think that the Surface Pro (204) compares well to a gaming-esque X1 tablet and the Asus notebook.

That doesn't mean that I didn't test the Surface Pro—just that I think the results should stand on their own. Matt Smith's review of the Surface Laptop (see page 47)



has a much better opportunity to answer this question, comparatively.

When I connected the Surface Pro (2024) tablet to a pair of wired headphones (gasp!) and performed our standard video rundown test—set the luminance to 250 to 260 nits and loop a 4K video until it expires—the Surface Pro lasted 13 hours 44 minutes. Fantastic! But I thought, well, would Bluetooth deliver better battery life? It's more realistic, anyway. So I ran the same test connected to Bluetooth headphones. The tablet lasted 13 hours 47 minutes or about the same.

If you go *all* the way back to the first few paragraphs of this review, though, you'll remember that there's an issue with how the Surface Pro's Snapdragon X Elite chip handles intensive loads. So let's talk about that briefly. First, there's good news: Using the PCMark 10 Apps rundown test (which simulates Microsoft Office work over the course of a day) still yielded battery life of 10 hours, 29 minutes.

But Microsoft 365 or Office apps are relatively light workloads *and* they're optimized for Arm. I don't have a huge amount of data supporting this thesis, but when I ran an intensive, *unoptimized* Handbrake test, it finished in just under 34 minutes. It chewed through a whopping *31 percent* of the available battery, enough that Windows reported that it only had 1 hour and 15 minutes left. That's huge! But it's a potential Achilles' heel of the Surface Pro (2024).

The PugetBench Photoshop benchmark finished in about 27 minutes. It's running Photoshop, but an optimized version. When it was done, 89 percent of the battery was left… though Windows thought that equated to about 3 hours and 15 minutes left. Again, not great, but unoptimized apps may make a difference here, *especially* on battery.

As for the optimized version of Handbrake? Um, well, ugh. My test took 34 minutes, and dropped the battery from 68 percent to 35 percent. That's a 33 percent drop in 34 minutes.

On wall power, the Surface Pro is excellent performance-wise. On battery, it can last for hours and hours…provided it's not doing much.

BOTTOM LINE

Here's where I stand: the Surface Pro (2024) 11th Edition shows definite promise. Arm's CEO didn't tell me (fave.co/3Vj6hIV) that half of the world's PCs will eventually run Arm. But you know, there's a decent case to be made that a chunk of the world's business and productivity PCs could eventually switch from X86 to Arm. That's

The Surface Pro (2024) 11th Edition shows definite promise.

Microsoft's Surface Pro points the way to the future of productivity PCs, but it needs to solve some nagging issues before it can get there.

what they need, after all: long battery life and moderate performance.

But the Snapdragon X Elite undercuts that. Snapdragons have always been engines of weak to moderately powered PCs, but with battery life that lasts and lasts. Now, Qualcomm is dashing to become the fastest CPU. And it's succeeding, at least when plugged in.

But on battery, under load—and especially with an unoptimized app that requires it to rev up and rev up hard—Arm's sacrificing battery life for additional performance.

I liked the Surface Pro 9 (5G) because it ran Microsoft's core apps well, and that was all I thought customers would ask of it. Now Windows on Arm's ecosystem is expanding. The border is moving through Adobe's productivity sphere right now.

Again, though, this isn't the "it just works" tablet we all hoped for. It mostly works. In some sense, the Surface Pro (2024) 11th Edition feels like a powerful Chromebook, doing just short of everything you'd want from a productivity machine and very little in the way of gaming.

I haven't tested the Meteor Lake version of the Surface Pro. I don't care at all that Intel's Lunar Lake is coming—something always is. But I'm still inclined to stick with the tried-and-true world of Intel's Core Ultra and AMD's Ryzen processors rather than make the leap to Windows on Arm—not just yet. I'm also more confident that Arm could be the way forward for a good chunk of the PC market. This story isn't over.

Microsoft Surface Pro (2024)

★★★★☆

PROS

- Performance is excellent on native apps and when plugged in.
- Value is unexpectedly good.
- Wireless Flex Pro keyboard is great in concept.

CONS

- Emulation performance isn't great, and some apps won't run.
- Battery life suffers when tablet has to work hard.
- AI experiences are decent, but not really there yet.

BOTTOM LINE

Microsoft's first Copilot+ tablet, the Surface Pro (11th Edition) balances upon a growing ecosystem of native Arm apps that run efficiently on its Snapdragon X Elite processor. Performance is solid, but the AI experiences aren't fully there.

From $999

Microsoft Surface Laptop 7: A new era for Windows laptops

The incredible battery life and efficient performance in Microsoft's Surface Laptop 7, powered by Qualcomm's Snapdragon X Elite chip, come at a cost. **BY MATTHEW S. SMITH**

It's a new era for Windows PCs.

The latest Microsoft Surface Laptop (alongside the revised Surface Pro) ditches Intel and AMD hardware for Qualcomm chips. This isn't a first, as previous Surface devices like the Surface Pro 9 5G (fave.co/3ghcbtC) also used Qualcomm. But those devices were introductory sideshows to the main event.

The new Surface Laptop is available only with Qualcomm's Snapdragon X Elite chip. No Intel or AMD variants are available or planned. This bold move helps the Surface Laptop achieve strong performance and

IMAGE: MICROSOFT

spectacular battery life in a thin laptop, in addition to standing as Microsoft's debut AI-infused Copilot+ PC (fave.co/3xQjYr5).

The new Surface Laptop has a sleek aluminum body that looks luxurious and feels rigid.

SPECS AND FEATURES

The Microsoft Surface Laptop's most intriguing hardware is, of course, the Qualcomm Snapdragon X Elite chip. It's a system-on-a-chip that pairs up to 12 CPU cores with Qualcomm Adreno integrated graphics. Entry-level Surface Laptop variants have a 10-core processor, but the one I tested had the 12-core upgrade.

CPU: Qualcomm Snapdragon X Elite (12-core)

Memory: 32GB LPDDR5x

Graphics/GPU: Qualcomm Adreno integrated graphics

Neural Processing Unit (NPU): Qualcomm Hexagon

Display: 13.8-inch, 2304×1536 resolution, 3:2 aspect ratio, 120Hz IPS-LED touchscreen

Storage: 1TB PCIe Gen 4 solid state drive

Webcam: 1080p with dual-mic array

Connectivity: 2× USB-C, 1× USB-A, 1× Surface Connector, 1× 3.5mm combo audio

Networking: Wi-Fi 7, Bluetooth 5.4

Biometrics: Windows Hello facial recognition via webcam

Battery capacity: 54 watt-hours

Dimensions: 11.85×8.67×0.69 inches

Weight: 2.96 pounds

MSRP: $999.99 to start, $1,999.99 as tested

Processor aside, the Surface Laptop was well equipped with 32GB of RAM and 1TB of storage. These upgrades run up the price, though, which doubles from the entry fee of $999.99 to an as-tested price of $1,999.99. That's rather expensive, though comparable to other premium portable laptops like the Dell XPS 14 (fave.co/4cHnGSV) and Lenovo ThinkPad X1 (fave.co/3WGAELK).

DESIGN AND BUILD QUALITY

It's easy to mistake the new Surface Laptop for an older model at a glance—and I mean that as a compliment. The new Surface Laptop, like its predecessors, has a sleek aluminum body that looks luxurious and feels

rigid. It favors a minimalist look with no badging aside from the glossy Windows logo on the display lid.

Look closer, though, and a few details stand out. The display bezels are much smaller than on prior Surface Laptop models, and they're now rounded at the corners for a more organic, approachable look. The edges taper more aggressively than before, too, which makes the new laptop feel thinner in hand. The new Surface Laptop is technically thicker than its predecessor but feels more nimble.

The Surface Laptop weighs 2.96 pounds. That's a bit heavier than competitors like the Apple MacBook Air 13 M3 and Dell XPS 13 (fave.co/3S4k6tO), both of which weigh 2.7 pounds. Though the difference seems trivial on paper, I did notice it. In fact, the first thing I said while unboxing the Surface Laptop was, "Wow, this feels a bit chunky." Once you've placed it in a backpack or bag, however, the Laptop's extra ounces fade away.

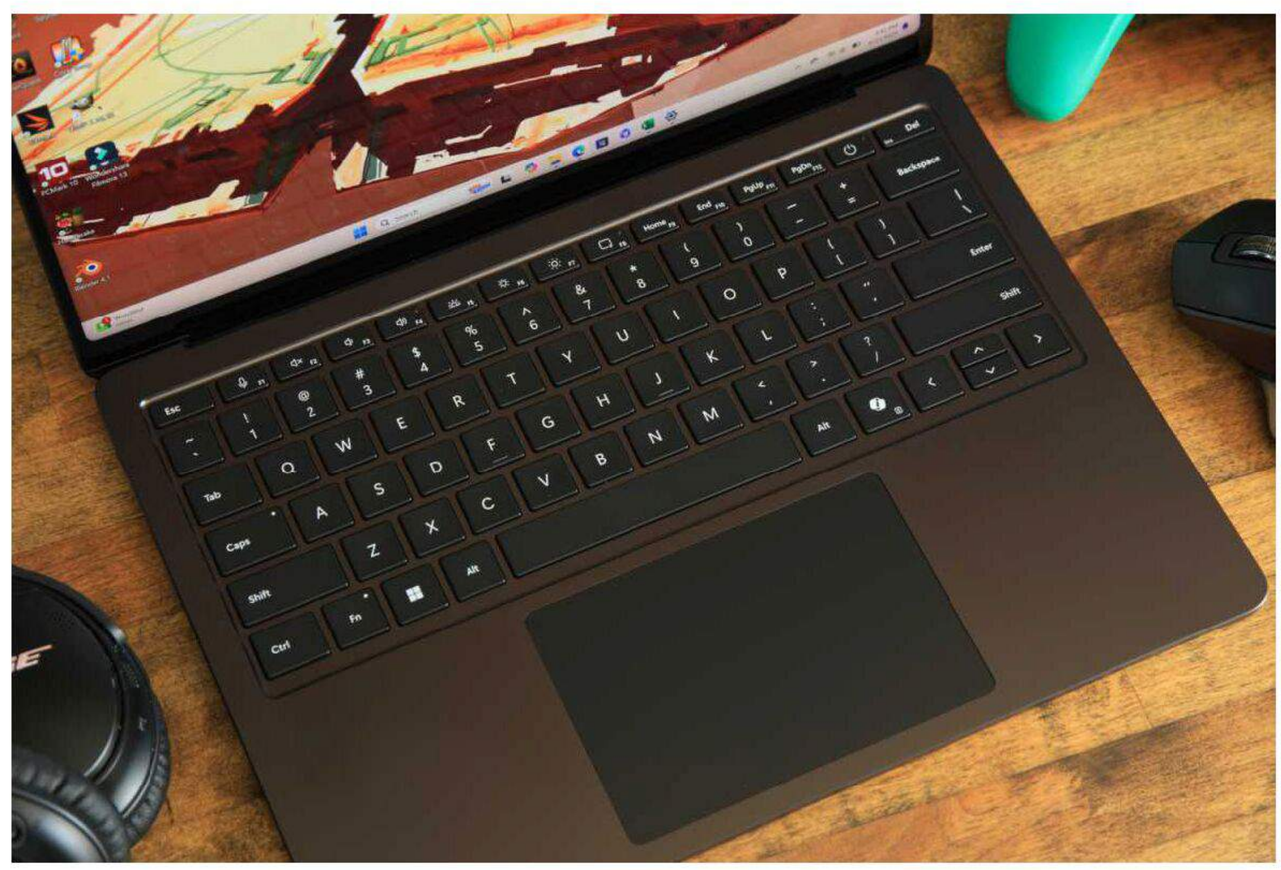
Microsoft continues to stick with an unusual display aspect ratio of 3:2, which is far closer to square than the more common 16:9 or 16:10 aspect ratios. As such, the Surface Laptop feels a bit boxier than competitors and it might not fit in some sleeves meant for a 13.3-inch widescreen laptop, as its dimensions are different from the norm.

But the 3:2 aspect ratio is an advantage if you frequently work with text documents or web pages, as you can see more vertical space at once. (In fact, the 13.8-inch Surface Laptop's vertical display height is identical to a 15.6-inch laptop with a 16:9 aspect ratio.)

KEYBOARD AND TRACKPAD

The new Surface Laptop's keyboard doesn't live up to expectations. It has a roomy layout with large palm rests, which makes it comfortable to use, but key feel is an issue. Keys activate with a mushy, quiet, ill-defined action that lacks feedback.

Don't get me wrong: It's usable. But I don't like it as much as the prior Surface Laptop (I own a Surface Laptop 4) or the keyboards found on competing laptops, like the Dell XPS 14 (fave.co/4cHnGSV) and Asus Zenbook 14 OLED (fave.co/3SjDWSm).



The keyboard has a roomy layout with large palm rests, which makes it comfortable to use.

A keyboard backlight comes standard—as is typical for a laptop in this price bracket—and offers three levels of brightness. It's a bit dim even at maximum brightness, so the backlight isn't easily visible when used in a bright room. However, the backlight's minimum brightness is very low, which is preferable if you use the laptop in a nearly pitch-black space.

While the keyboard is a miss, the touchpad is solid. It measures roughly 5 inches wide and a bit more than 3 inches deep, which is comparable to or smaller than other Windows laptops. But the touchpad felt extremely smooth and responsive.

It also handled multi-touch gestures (fave.co/3zKCfqj) with ease. Fans of Windows' pinch-to-minimize (and other more complicated multi-touch gestures) will be pleased. It also supports haptic feedback, which convincingly emulates the feel of a mechanical button when the touchpad is tapped.

DISPLAY AND AUDIO

As mentioned earlier, the Surface Laptop has an unusual 13.8-inch display with a 3:2 aspect ratio. It also has a unique resolution of 2304×1536, which works out to a pixel density of 200 pixels per inch.

That's a bit less than 14-inch competitors with a 16:10 aspect ratio and a resolution of 2880×1600, which hits about 242 pixels per inch. It's also less than a MacBook Air M3 13.6-inch, which delivers 224 pixels per inch. These numbers aren't as meaningful as they seem, though, because all three pixel densities look sharp in the real world. Still, the Surface Laptop is at a slight technical disadvantage as far as sharpness goes.

The Surface Laptop also continues to lag in display technology, as it sticks to an IPS-LED display without a dynamic backlight. That's bad news for the laptop's contrast ratio, which is far less impressive than competitors with an OLED display panel or Mini-LED display backlight.

It's not a problem when working in Word or Adobe Acrobat, but it's easy to notice when playing games or watching movies, especially in a dark room. The Surface Laptop looks less immersive and engaging than competitors like the Dell XPS 14 and Asus Zenbook 14 OLED.

That said, Microsoft strikes back with a 120Hz touchscreen that feels snappy. Many Windows laptops have abandoned the touchscreen, and others that offer touch—like the Dell XPS 14—stick to a lower refresh rate that feels less responsive. Plus, the Surface Laptop's traditional clamshell design isn't well suited to touch input (the hinge doesn't even fold back 180 degrees), but if you like to smudge up the screen, the Surface Laptop has you covered.

The 120Hz refresh rate can also, in theory, deliver a more fluid experience while playing PC games. However, the Surface Laptop's

The Surface Laptop has a 13.8-inch display with a 3:2 aspect ratio.

gaming performance and support isn't great, so finding titles that can run at up to 120 frames per second will be a struggle.

Audio performance is good, if not amazing. The Surface Laptop's speakers are extremely loud at maximum volume and sound good with less-complex content, like podcasts. Throw a bass-heavy track at the Surface, though, and the speakers become muddy and harsh.

The speakers are above average for most 13- to 14-inch laptops, but still behind audio leaders like the Dell XPS 13 and Lenovo Yoga 9i (fave.co/3SavhkS).

WEBCAM, MICROPHONE, AND BIOMETRICS

A 1080p webcam is packed into the Surface Laptop's thin top bezel. It provides acceptable video quality straight away, which is improved by AI-powered Studio Effects filters (a feature the Surface Laptop shares with other Copilot+ PCs). The filters add background blur, automatic framing, and real-time effects that, in practice, add up to decent video quality.

Microphone quality is great. It picked up my voice with excellent volume and easily filtered out background noise, including persistent noises (like a fan) just a few feet away from the laptop.

Biometric login is supported through Windows Hello facial recognition. It worked well in my testing and, because it uses an IR camera instead of the primary sensor, it's reliable in both very dark and bright rooms. Many competitive laptops support the feature, but it's good to see it included.

CONNECTIVITY

The bulk of the Surface Laptop's wired connectivity comes from a pair of USB-C ports on the laptop's left flank. Both ports support USB4, Thunderbolt 4, DisplayPort, and can accept up to 65 watts of Power Delivery. There's also a single USB-A 3.1 port for older devices and a 3.5mm combo audio jack for headphones, headset, or microphone.

Microsoft's Surface Connect is back. It's a proprietary data and power connector that magnetically attaches to the right flank. The bundled 65-watt power adapter uses Surface Connect instead of USB-C but, as mentioned, the USB-C ports support Power Delivery and can be used to charge and power the laptop as well.

Dedicated video-out (in the form of HDMI or DisplayPort) is missing, which might be annoying if you want to connect an older monitor or a modern TV. There's no wired Ethernet, either. You'll need a USB-C adapter, hub, or dock (fave.co/3vtA0BE) if you want to use the Surface Laptop with devices that require these ports. Though that's a tad disappointing, it's typical for a portable Windows laptop.

Wireless connectivity is excellent, with support for both Wi-Fi 7 and Bluetooth 5.4. Wi-Fi 7 is the latest wireless internet standard. It's so new, in fact, that very few people even have a Wi-Fi 7 router. Still, I think it's the right move to make Wi-Fi 7 standard. (Anyone willing to pay almost $2,000 for a well-equipped Surface Laptop is likely to be an early adopter of Wi-Fi 7, after all.)

PERFORMANCE

Microsoft's Surface Laptop is one of more than a dozen new Copilot+ PCs with a Qualcomm Snapdragon X Elite chip. The Snapdragon uses the Arm instruction set instead of the x86 instruction set that's common to Intel Core and AMD Ryzen processors.

Laptops with Qualcomm Snapdragon X Elite processors, like the new Microsoft Surface Laptop, promise better battery life and efficiency. However, Arm and x86 aren't natively compatible, which means Windows apps coded only for x86 won't run on Arm.

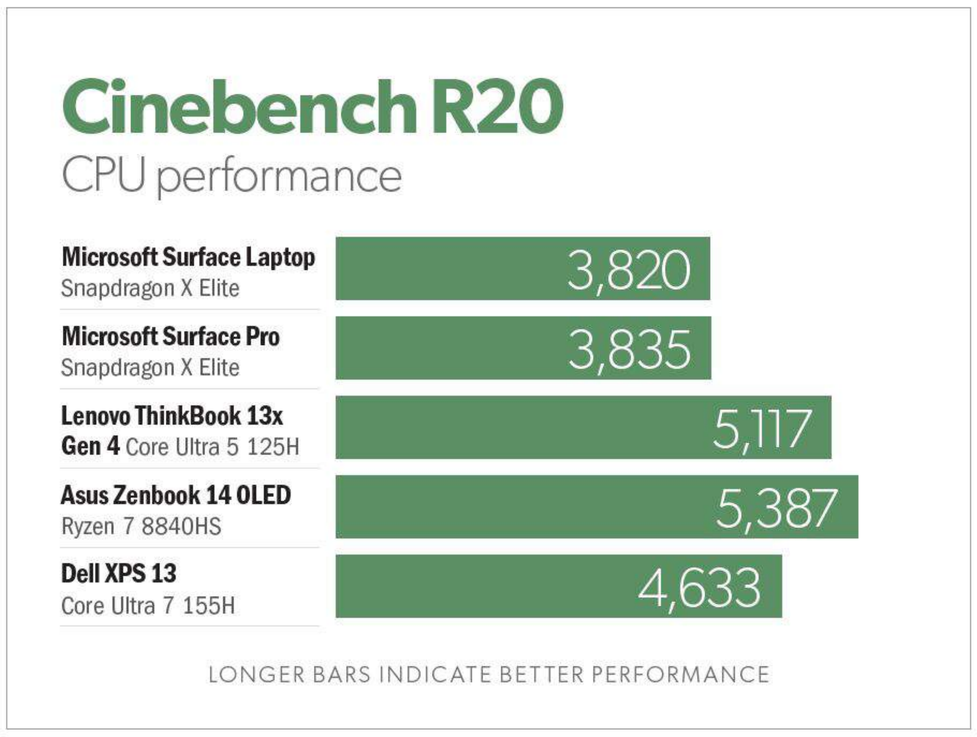
To solve that, Microsoft has aggressively urged software partners to develop new Arm-compatible software, meanwhile providing an emulation layer (called Prism) that can run x86 software on Arm hardware.

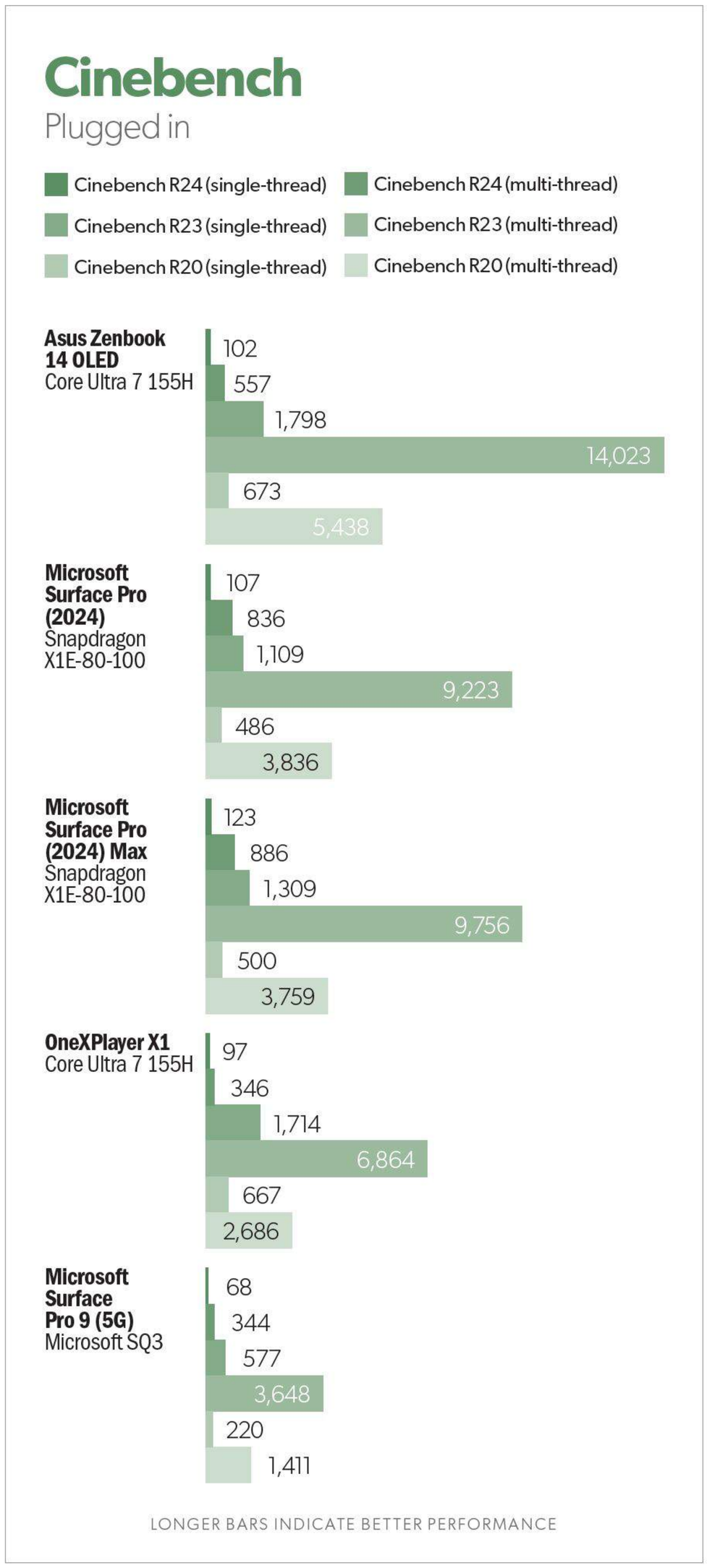
What does that mean for performance? Let's dig in.

Note: The Surface Laptop I tested had the 12-core Snapdragon X Elite, an upgrade over the 10-core chip in entry-level configurations.

Cinebench R20

Our first couple of CPU-focused benchmarks will take a wandering trail. First, we'll test the machine using our tried-and-true benchmarking suite, built for x86 chips, so we can see what the Snapdragon X Elite's performance looks like when it hits Windows 11's emulation layer. Immediately after, we'll show the difference in performance running the same software, but using Arm-specific builds for the Surface Laptop. Spoiler: It's huge, and drives home that while Qualcomm's chip is fast enough to run software well in any case, the Surface Laptop 7 shines when you can use programs built with Arm's architecture in mind.

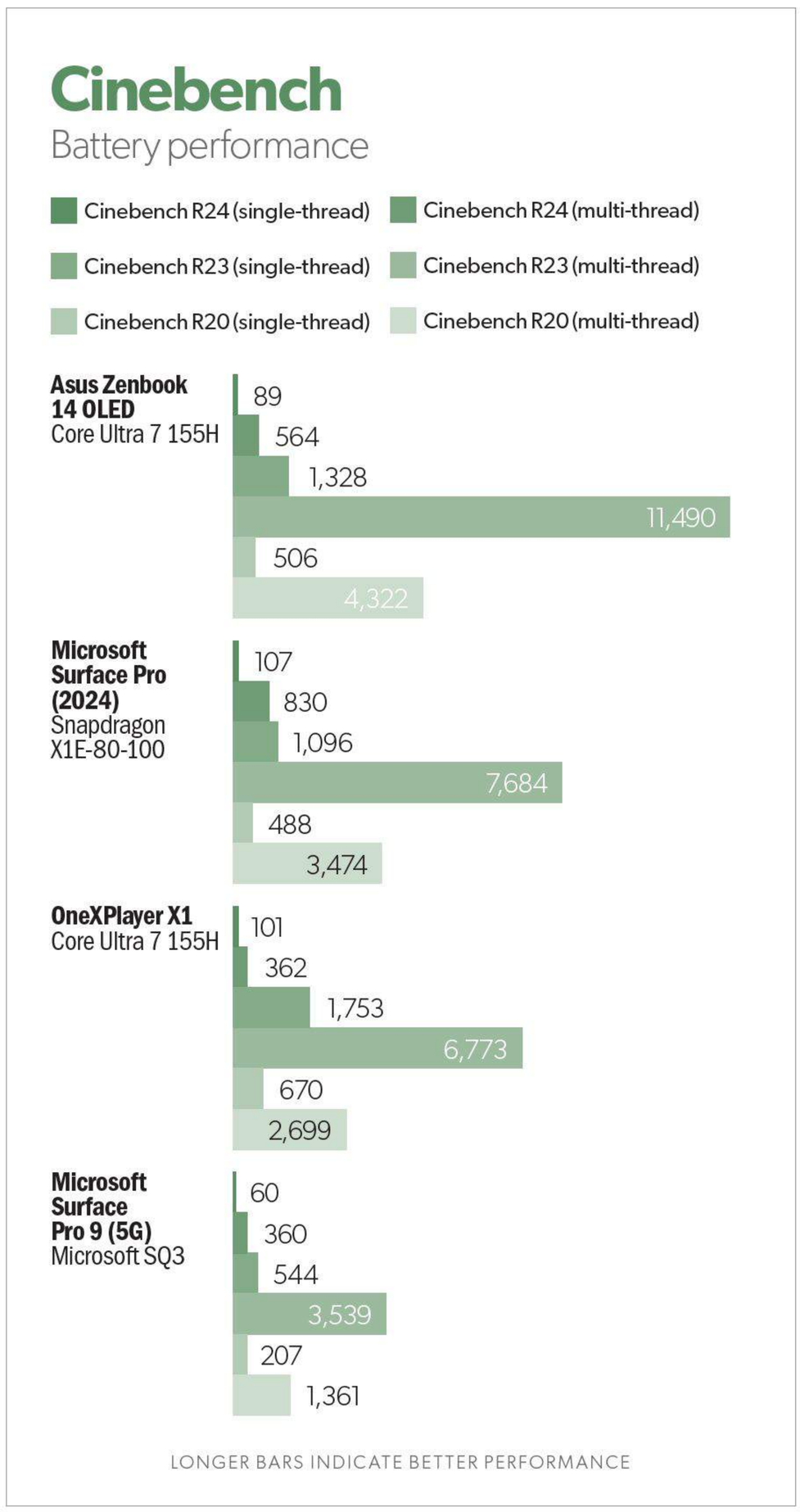




First up is Cinebench R20, a heavily multithreaded CPU benchmark. This version of the benchmark doesn't support Arm, so the new Surface Laptop uses emulation to run the benchmark. The emulation's stability was perfect in this test, with no crashes or bugs, but the need to run the software through Windows 11's emulation layer clearly affects performance.

The Surface Laptop is certainly slower than the x86 competition in this test, but it's not a bad result for software that runs under emulation. The performance of both the Surface Laptop and Surface Pro creeps close to that of the Dell XPS 13 (fave.co/3S4k6tO), which has an Intel Core Ultra 7 155H processor. But the green benchmark lines below show just how truly potent the Snapdragon X Elite can be when it's running native Arm software.

The charts above show how the Microsoft Surface Pro (see page 25), which has the same processor (Qualcomm Snapdragon X Elite) as the Microsoft Surface Laptop, fares in the Arm-compatible version of Cinebench, R24. That benchmark actually includes a dedicated Arm version, which is compatible with Qualcomm's processor. We've included two charts, one where the Pro is plugged in



and one where it isn't—and Qualcomm leads the pack in both single- and multi-threaded performance. It's not particularly close, either.

While we don't have the Cinebench R24 scores for the Surface Laptop 7 just yet, we do have them for the Cinebench R23. It turned in a very respectable multi-threaded score of 8,896 as well as a single-threaded score of 1,091. As you can see in the charts above, performance is comparable to the Microsoft Surface Pro, so we're comfortable stating that the chart-topping performance shown in the Arm-native R24 should be similar as well.

Basically, if you're going to buy a laptop with the new Qualcomm processor, use the Arm-compatible versions of software if you can, especially if you're performing intense tasks that pound CPU threads like Cinebench does.

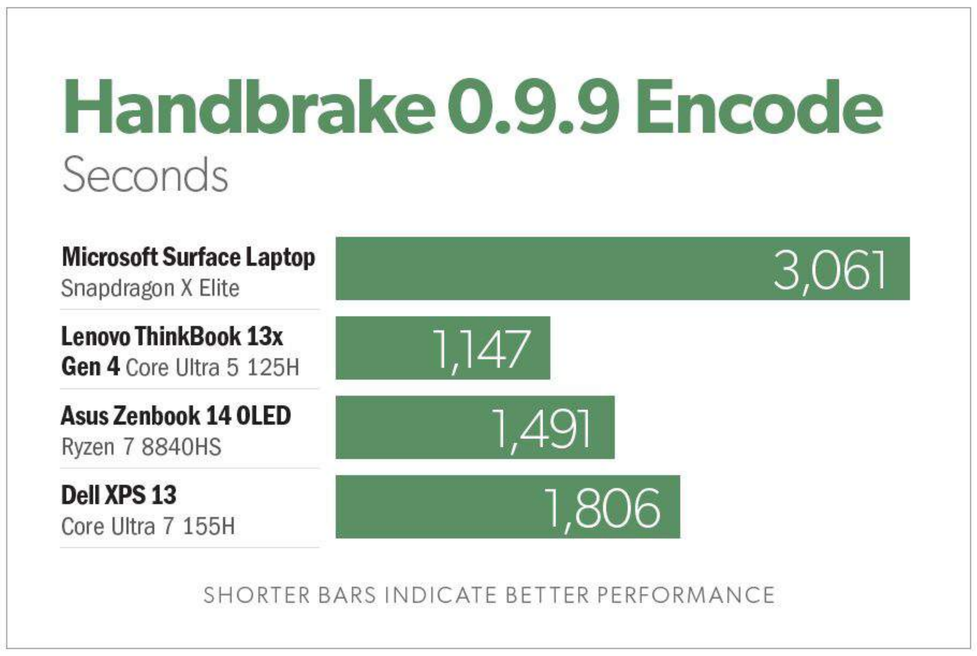
Handbrake

Next up is Handbrake. Though it does have an Arm version available, that version is much newer and not comparable to the version of the software we typically use. Because of that, the benchmark shown above runs under emulation.

And here, like Cinebench, the Snapdragon X Elite has problems. The benchmark was stable but required a dreadfully long time to finish. Clearly, emulation has met its match with this test.

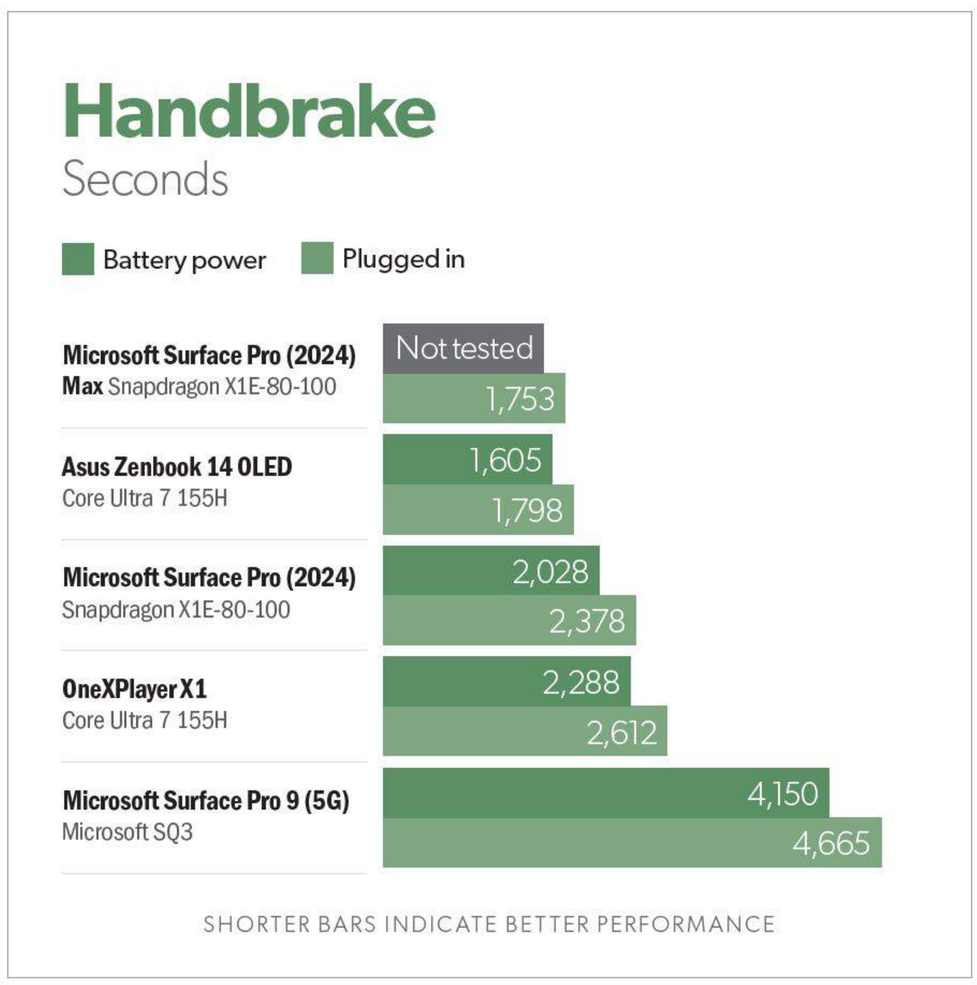
But also as with Cinebench, switching to an Arm-compatible version of Handbrake drastically improves performance, making the Snapdragon X Elite a true contender with Intel's best chips.

The chart at right shows Arm-compatible Handbrake scores for the Microsoft Surface Pro (see page 25), as again, it has the same processor as the Surface Laptop 7. Without the need to hit Windows 11's emulation layer,



the Qualcomm chip delivers comparable (or better) performance than rival Intel Core laptops, depending on the configuration.

It's worth saying one more time: Performance is *vastly* better in native Arm apps that don't hit the emulation layer, though in practice, most day-to-day software feels perfectly snappy and responsive on the Snapdragon X Elite platform. More on that after the benchmarking section.

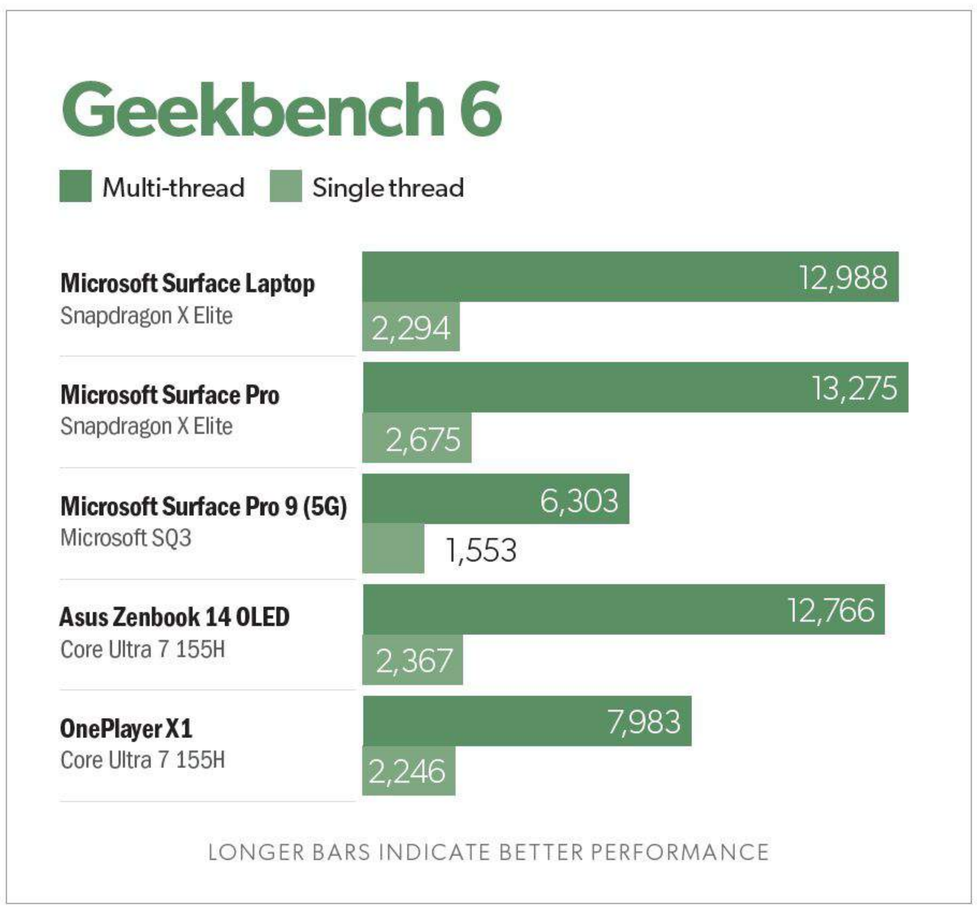


Geekbench 6

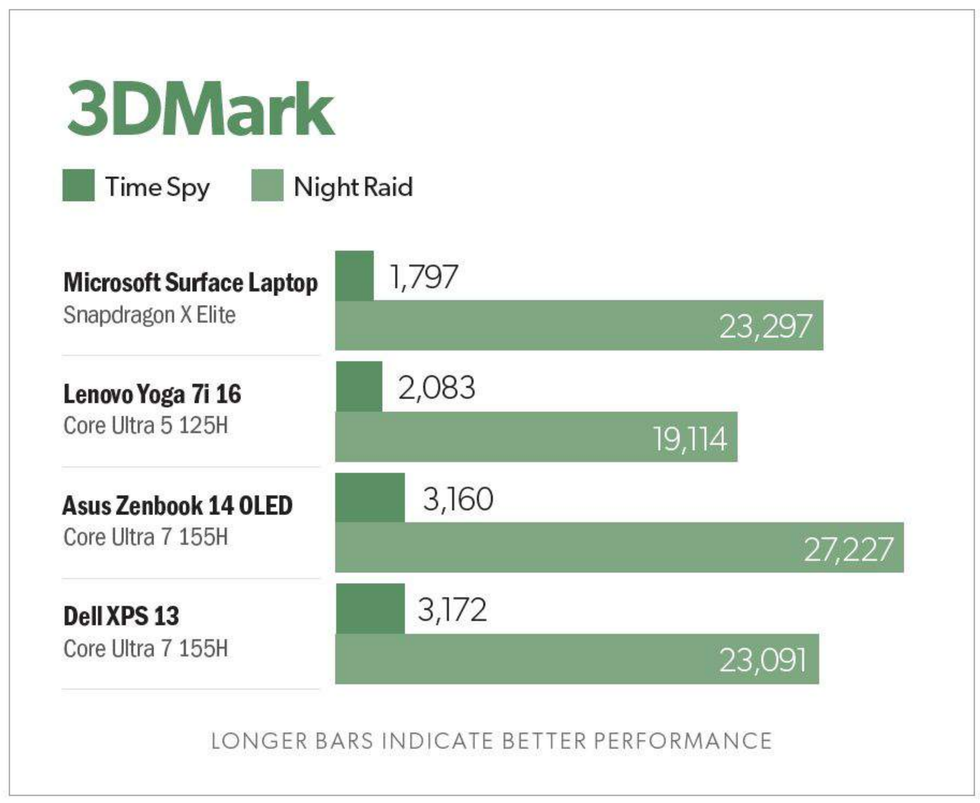
Next up is Geekbench 6. This synthetic benchmark isn't part of our normal test suite, so we have less data on laptops using it. It has an Arm-native version, however, so no emulation is required.

And what a difference it makes! The Surface Laptop hits an impressive multi-core score of 12,988. That edges out the Asus Zenbook 14 OLED, fave.co/3SjDWSm (which itself is among the more capable laptops with an Intel Core Ultra processor), and easily defeats the OneXPlayer X1 (a Windows tablet forced to fit Intel's Core Ultra in a tight wattage envelope).

And the new Surface Laptop is roughly twice as fast as Microsoft's Surface Pro 9 5G. Launched in 2022, the Surface Pro 9 5G has a custom chip—the Microsoft SQ3—which was designed in collaboration with Qualcomm and based on the



Snapdragon 8cx. Clearly, Qualcomm's performance has improved since then.



3DMark

The Snapdragon X Elite's processor performance looks good, but what about the integrated GPU?

Qualcomm and Microsoft have spent less time marketing the performance of Qualcomm's Adreno graphics, aside from a demonstration at Microsoft Build 2024 that showed games like *Borderlands 3* and *Baldur's Gate 3* running through Prism emulation.

3DMark's Time Spy and Night Raid tests provide a lot to dig into. Time Spy does not run native on Arm, but Night Raid does, and that has obvious implications for performance.

The Surface Laptop lags far behind Intel Iris Arc and AMD Radeon 780M integrated graphics in Time Spy. In Night Raid, however, Qualcomm's Adreno powers the Surface Laptop to a respectable score of 23,348, which trades blows with Intel and AMD's best integrated graphics.

Does Snapdragon X Elite work in the real world?

The Microsoft Surface Laptop's benchmark results look solid on paper. Qualcomm's Snapdragon X Elite is on par with, or slightly quicker than, Intel and AMD alternatives when apps have native Arm versions available. Performance under Prism emulation varies but, at its best, it doesn't inflict a terrible penalty.

But a benchmark suite can only represent a small slice of apps, and my day-to-day experience was simultaneously worse than and better than these benchmarks suggest.

First, the bad news: I don't think gaming is viable at launch. Microsoft knows this because, during the Reviewer's Workshop held to answer questions from reviewers about the laptop, the company downplayed the laptop's gaming performance. (Microsoft Devices VP Pete Kyriacou also told PCWorld that the Snapdragon X Elite-powered Surfaces will excel in productivity, not games (fave.co/3Y2oyNC). Microsoft said Qualcomm chips don't support discrete GPUs or external GPUs, so there's no way to upgrade performance or side-step Qualcomm's Adreno graphics.

These problems aren't just in demanding games, like *Cyberpunk 2077* or *Total War: Warhammer III*. I was surprised and disappointed to find that recent indie favorite, *Halls of Torment*, failed to play smoothly, despite the fact that it relies entirely on 2D graphics. PCWorld will have more to report on the Surface Laptop's gaming performance in an upcoming article, but for now I caution gamers to sit on the sidelines.

If you want a laptop for productivity and content creation, though, the Surface Laptop holds promise. The apps I use for professional work include the Microsoft Office suite (for writing, editing, and time tracking), GIMP (for photo editing), and Wondershare Filmora (for video editing).

While I expected Office to work without flaws, I was surprised to find that both GIMP and Filmora support Windows on Arm. Both apps worked flawlessly, and the Surface Laptop performed well enough when I opened the Filmora project file for my 43-minute-long video about the development of *Baldur's Gate 2* (fave.co/3xNaXz3). The timeline took a moment to fully load when I was flipping back and forth, but the video played just fine in the editor without dropping frames. Cutting, moving, and copying clips all operated smoothly.

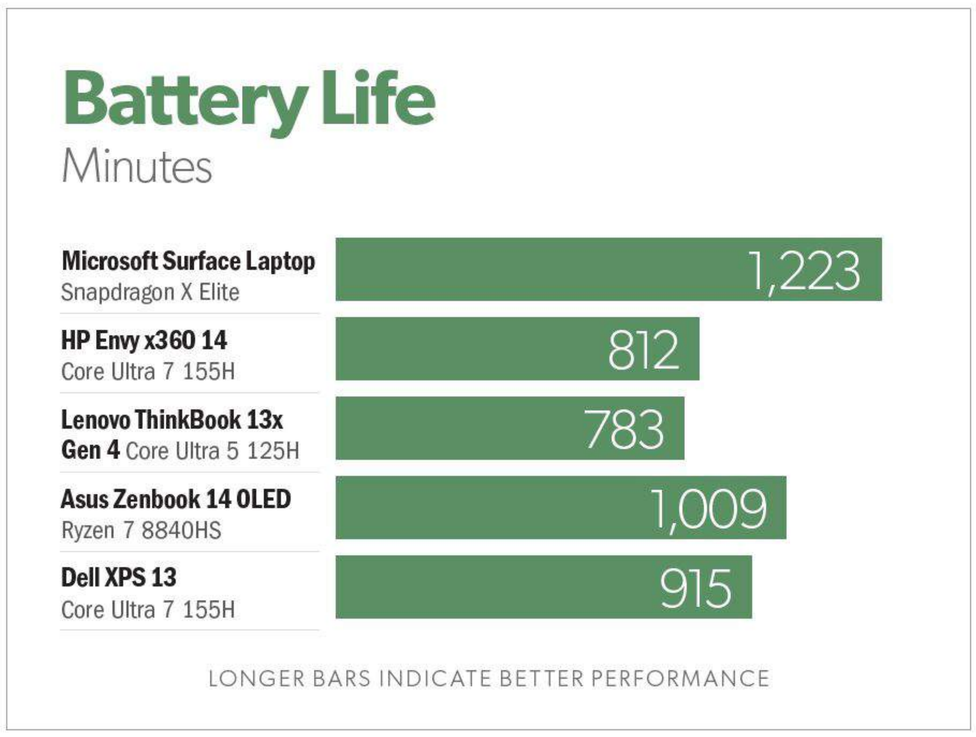
The list of productivity apps with Arm support is decent and growing. Notepad++, Adobe Photoshop and Lightroom, and DaVinci Resolve 19 all support Arm (although in some cases the Arm version is still in beta). Adobe Premiere Pro, Illustrator, InDesign, and After Effects will all receive Arm updates this year.

If you just want to browse the web and watch Netflix, you're unlikely to run into issues. Most web browsers, streaming platforms, and videoconferencing software support Windows on Arm. Apps that don't support it yet should still run well under emulation. And while I can't guarantee every app will work perfectly, I didn't see problems in my testing. Aside from games, every app I used launched, and none crashed in my time using them.

A note about Copilot+ PCs

The Surface Laptop, like other Copilot+ PCs, has an integrated neural processing unit (NPU) that can handle up to 45 trillion operations per second, and it was meant to highlight Windows 11's AI features. Instead, however, the Copilot+ PC launch is a public relations disaster.

The flagship feature, Microsoft Recall, is indefinitely delayed over security and privacy concerns (fave.co/4eXeCLf). Microsoft has reeled in the features of Windows' Copilot app, too. Earlier preview versions could adjust settings and search files, but the version currently available lacks those features.



BATTERY LIFE

Qualcomm's Snapdragon X Elite is quick, to be sure, but power efficiency is the chip's real claim to fame. Microsoft says the Surface Laptop can provide up to 20 hours of video playback, a promise it easily fulfilled.

Real-world battery life lived up to expectations set by the benchmark. I often used the laptop for several hours at a stretch, yet saw the battery reduce by no more than 10 percent. My use is light (mostly web browsing and writing in Word or Google Docs), but the Surface Laptop's endurance is much better than usual for a Windows laptop.

These results are even more remarkable given the Surface Laptop's modest 54 watt-hour battery. Many competitors with AMD or Intel hardware, like the Lenovo ThinkBook 13x and Asus Zenbook 14 OLED, have a battery capacity above 70 watt-hours.

Still, the Surface Laptop's battery life is spectacular. In fact, I'd say it's the most significant threat to alternatives with AMD and Intel hardware. Battery life like this fundamentally changes how the device is used, providing peace of mind when leaving the house without a charger.

BOTTOM LINE

Microsoft's Surface Laptop is a success, though not without its issues.

After years of misfires, Arm on Windows is finally a viable option. With it comes access to new hardware: Qualcomm's Snapdragon X Elite, which proves an alluring alternative to Intel and AMD devices. Qualcomm's chip isn't a good choice for gaming, but it's great for battery life and it scores very well in CPU benchmarks with native Arm support.

These traits make the Surface Laptop a solid choice for people who travel frequently or just don't like to worry about battery life.

Microsoft Surface Laptop 7

★★★★☆

PROS
- Attractive, slim, and light.
- Class-leading battery life.
- Excellent wireless connectivity via Wi-Fi 7.
- Good performance in real-world situations.

CONS
- Vague keyboard falls short of competitors.
- IPS touchscreen's image quality can't compare to OLED.
- Gaming performance doesn't hold up.

BOTTOM LINE
The Microsoft Surface Laptop's strong processor performance and top-tier battery life prove that Windows' transition to Arm has staying power, but even the most casual gamers should think twice.

From $999

Lenovo Yoga Slim 7x: OLED meets long battery life

This Copilot+ PC is a showcase for Qualcomm's Snapdragon X Elite. **BY CHRIS HOFFMAN**

PCWorld EDITORS' CHOICE

The Lenovo Yoga Slim 7x (fave.co/462tJiB) is one of the first Copilot+ PCs (fave.co/3za4DSf). While Microsoft is talking up AI features, the real story here is the Qualcomm Snapdragon X Elite hardware (fave.co/3YbHaum) inside this PC. Microsoft has been releasing Arm-based Windows PCs since the Surface RT, but this is the first time that Arm-based Windows PCs (fave.co/3Vj6hIV) have finally become seriously competitive.

Yes, this Snapdragon X Elite–powered 14.5-inch laptop delivers extremely long battery life with snappy performance and cool and quiet operation in day-to-day use. The experience with day-to-day productivity applications is beautiful—just like the OLED

IMAGE: LENOVO

display this machine has. (Despite the Yoga name, however, this is not a 2-in-1 laptop; fave.co/3V5T2cQ.)

Of course, the Windows on Arm experience isn't perfect. Microsoft's Prism translation software (fave.co/3zDBwau) offers much improved compatibility with traditional x86 apps. Most existing x86 applications "just work," but not everything "just works" at the moment. And, while gaming performance is decent thanks to both the Prism translation layer and the impressive integrated GPU, this can't deliver as much graphical horsepower as a discrete Nvidia or AMD GPU in a more traditional gaming laptop (fave.co/3n3aNKv).

Snapdragon® X Series Platforms: SKU Comparison Table

Snapdragon® X Series Platforms: SKU Comparison Table

		Qualcomm Oryon™ CPU				Qualcomm® Adreno™ GPU	Qualcomm® Hexagon™ GPU	Memory	
Platform	Part Number	Cores	Total Cache	Max Multithread Frequency	Dual Core Boost	TFLOPs	NPU TOPS	Memory Type	Transfer Rate
Snapdragon X Elite	X1E-84-100	12	42 MB	3.8 GHz	4.2 GHz	4.6	45	LPDDR5x	8448 MT/s
Snapdragon X Elite	X1E-80-100	12	42 MB	3.4 GHz	4.0 GHz	3.8	45	LPDDR5x	8448 MT/s
Snapdragon X Elite	X1E-78-100	12	42 MB	3.4 GHz	None	3.8	45	LPDDR5x	8448 MT/s
Snapdragon X Plus	X1P-64-100	10	42 MB	3.4 GHz	None	3.8	45	LPDDR5x	8448 MT/s

Get the latest Product Briefs and more info about the Snapdragon X Elite and Snapdragon X Plus

Snapdragon and Qualcomm branded products are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

Qualcomm Snapdragon comparison.

SPECS

The Lenovo Yoga Slim 7x is part of the first wave of Copilot+ PCs, and it includes an Arm-based Qualcomm Snapdragon X Elite chip. All Snapdragon X Elite chips include a neural processing unit (NPU), fave.co/3VJ0eyD, capable of 40 trillion operations per second (TOPS) as well as a Qualcomm Adreno GPU. This particular machine has Snapdragon X Elite X1E-78-100 hardware.

There are four Snapdragon X packages at launch, from lowest-end to highest-end:

- The Snapdragon X Plus X1P-64-100 avoids the Elite name and only has 10 cores.
- The Snapdragon X Elite X1E-78-100 in this machine includes 12 cores.
- The Snapdragon X Elite X1E-80-100 has 12 cores as well, but it gains a Dual Core Boost feature that can go up to 4.0 GHz for extra power when the CPU needs it.
- The Snapdragon X Elite X1E-84-100 has 12 cores, but its Dual Core boost goes up to 4.2 GHz. It also offers faster multi-threaded CPU performance and a high-performance Qualcomm Adreno GPU.

It's unclear how much the differences between these chips will matter in the real world until we see more reviews and have a chance to benchmark more laptops with the different models ourselves.

There aren't a lot of other hardware options when configuring this $1,199 machine. Our review model came with 16 GB of LPDDR5X-8448MHz RAM, but you can get this machine with 32 GB of RAM for an extra $69. As in many modern PCs, the RAM is

soldered. You have to make your decision when buying the machine—you can't upgrade it later.

Additionally, our system included a 512 GB PCIe Gen4 SSD for storage. You can upgrade to a 1 TB SSD for an extra $45. Those are *very* reasonable prices for the upgrades. At that price, I'd recommend it.

This machine has a neural processing unit (NPU) that can deliver 45 TOPS (trillion operations per second) of performance. That means it gets access to a variety of Copilot+ PC AI features (see page 94). Unfortunately, with the splashy and controversial Recall feature (fave.co/4bVAAwo) delayed, the AI features on Copilot+ PCs aren't particularly compelling at launch. They may become more so in the future, especially when Recall launches, or if third-party application developers start using the NPU to power AI features in their Windows applications.

CPU: Qualcomm Snapdragon X Elite X1E-78-100

Memory: 16 GB LPDDR5X-8448MHz

Graphics/GPU: Qualcomm Adreno

Display: 2944×1840 OLED with 90Hz refresh rate and touch screen

Storage: 512GB PCIe Gen4 SSD

Webcam: 1080p camera with shutter switch

Connectivity: 3× USB-C Full-Function ports (USB4 Gen 3, Power Delivery 3.1, DisplayPort 1.4)

Networking: Wi-Fi 7, Bluetooth 5.3 (with Bluetooth 5.4 capable hardware)

Biometrics: IR camera for Windows Hello

Battery capacity: 70 Watt-hours

Dimensions: 12.8×8.86×0.51 inches

Weight: 2.82 pounds

MSRP: $1,199 as tested

DESIGN AND BUILD QUALITY

While there are some transformational changes found under the hood, Lenovo didn't reinvent the wheel with the Lenovo Slim 7x's design. The chassis is a spitting image of the Lenovo Slim 7 14 (fave.co/3TQQsrW) that we reviewed just a few months ago.

The Lenovo is made of aluminum and has a nice smooth metallic finish with lots of rounded edges.

Like that laptop, this machine is made of aluminum and has a nice smooth metallic finish with lots of rounded edges and a small bezel around the display. Lenovo calls this laptop's color scheme Cosmic Blue. It's a nice, dark, professional-looking metallic finish. It has the communications bar at the top of the laptop's display. That bar gives the webcam and IR camera a place to live, letting Lenovo shrink the bezel around the screen—and giving you a convenient handhold when opening the laptop.

While this machine bears the Yoga name, it doesn't have a 360-degree hinge. This laptop does have a touch screen, but it's not a convertible 2 in 1. In fact, the screen doesn't even lie flat. That's fine, but I do think it's a little confusing considering what the Yoga name has meant in the past. I showed this machine to another person who expected it to be a 2-in-1 thanks to the Yoga name. Lenovo says that it's moving forward with using the Yoga name for more laptops in the U.S. and that it's already been using the name in this way internationally. Once again, that's fine—just don't be misled by the name.

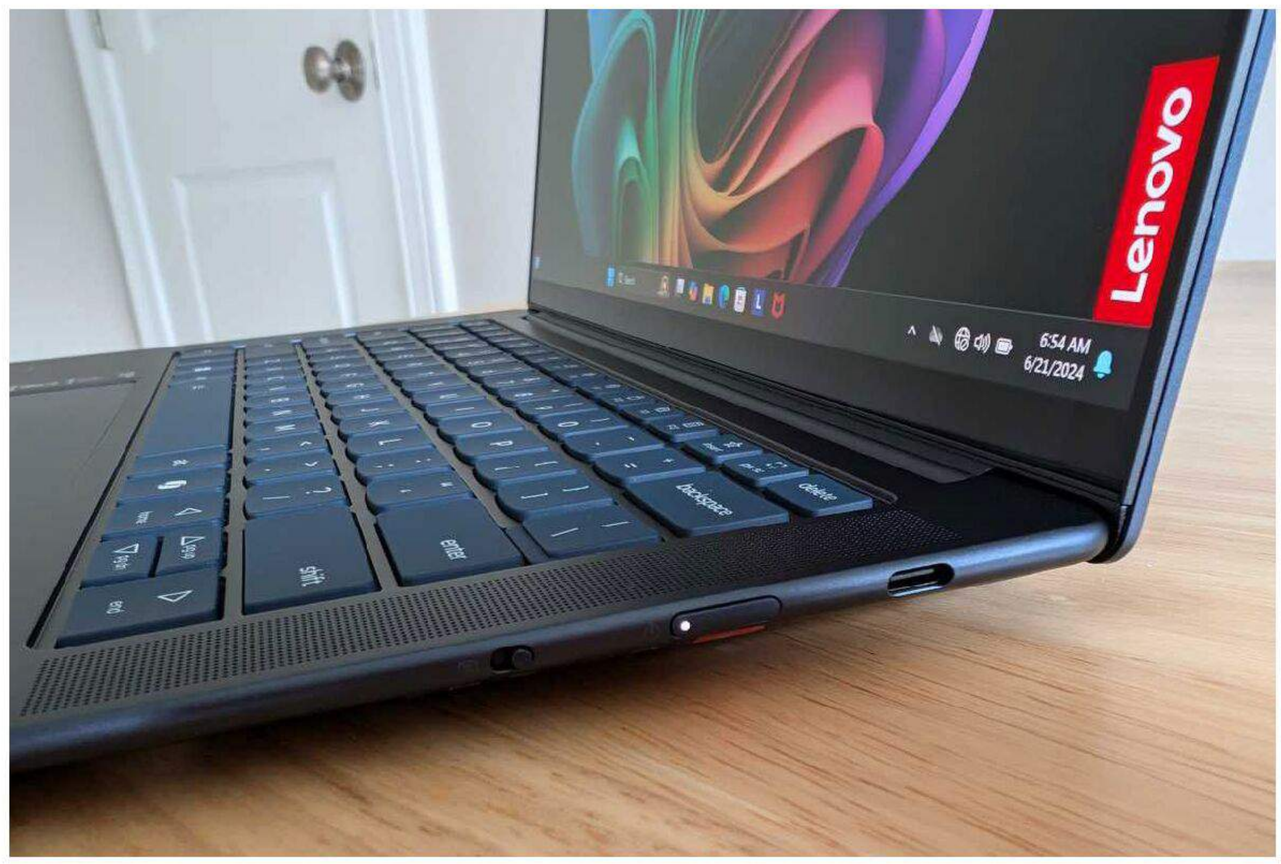
At 2.82 pounds, this is a nice light laptop. The build quality feels nice and premium—the laptop is solid and doesn't flex in any strange ways. The hinge action feels great. Lenovo says this "durable aluminum design" is tested to MIL-STD 810H military-grade standards, and it feels solid and sturdy while remaining lightweight.

Software-wise, this is a familiar Lenovo laptop experience. Bloatware is very restrained, but Lenovo does install a trial of McAfee antivirus (fave.co/4cH3xfS), which will show you popups with a "welcome offer."

Unlike Microsoft's Surface Laptop (see page 47), however, which omits the stickers below the keyboard, Lenovo chose to stick a variety of stickers to the left of the touchpad. It would be nice to see manufacturers move on from those stickers, but maybe we'll be stuck with them going forward.

KEYBOARD AND TRACKPAD

The Lenovo Yoga Slim 7x's keyboard feels very nice to type on. The specs sheet says it has 1.5mm of key travel, which is nice for a



The keyboard feels very nice to type on.

laptop—especially one this thin. With plenty of travel, the keys are enjoyable to type on. They're pleasantly snappy. This is no surprise as we spoke positively about this keyboard in our Lenovo Slim 7 14 review, too. The keyboard also has a nice white backlight.

The touchpad here is good. It's a fairly standard touchpad with a reasonable size, accurate tracking, a good click, and solid palm rejection. These days, a standard touchpad on a PC laptop is pretty good. Lenovo hasn't gone above and beyond the average ultrabook when it comes to the touchpad—but that makes sense, as this is a pretty good price. In addition to the touchpad, this machine also has a touch screen.

The display is one of the big reasons you'd pick this machine out of the first Copilot+ PC lineup.

DISPLAY AND SPEAKERS

The Lenovo Yoga Slim 7x's display is the star here. Lenovo included a 14.5-inch 2944×1840 OLED display with a 16:10 aspect ratio, a 90Hz refresh rate, and a touch screen. It's a bright, beautiful display. An OLED display means deep dark blacks and vivid colors, and you're getting that here.

Really, it bears repeating: That display is one of the big reasons you'd pick this machine out of the first Copilot+ PC lineup. Microsoft's Surface Laptop isn't available with an OLED display, so you would have to go for a Surface Pro tablet or a laptop from another manufacturer for that.

In our review of the Intel Core Ultra-powered Lenovo Slim 7 14 (fave.co/3TQQsrW) from earlier this year, we noted that its 1920×1200 OLED display was a step behind the competition. The upgraded display is awesome. And, thanks to the Snapdragon X Elite hardware here, Lenovo managed to deliver a higher-resolution OLED display and longer battery life versus than the Intel-powered Lenovo Slim 7 14.

The OLED display is a little on the glossy side and can pick up reflections, as you'll notice in some of the photos in this review. But it's bright enough that it was plenty readable even in the direct sunlight

outdoors, which is a worst-case scenario for any laptop.

The speakers here are similar to those on that Intel-powered model. There are upward-firing speakers on each side of the keyboard. In our review of the Slim 7 14, we said that the speakers were typical for a laptop of this size and price range, saying that they "provide acceptable audio with good volume and clarity, but they lack the depth and complexity available in Lenovo's more expensive laptops and 2-in-1s." That's a spot-on description of this laptop's speakers, too.

WEBCAM, MICROPHONE, BIOMETRICS

The Lenovo Yoga Slim 7x includes a 1080p webcam, which is on the communications bar that juts out a tiny bit above the display. It's a nice webcam, and the quality seems a touch better than some other 1080p webcams I've used recently. It'll be great for video meetings.

This machine has a physical webcam switch on its right side. Flip the switch and the webcam will be cut off. You might prefer a physical shutter that covers the laptop's webcam if you're a fan of webcam privacy tricks, but that's often a more expensive feature for higher-end business laptops (fave.co/4dAHckZ).

The system has an IR camera for Windows Hello logins. It works very well: You can open your laptop, and it sees your face and signs you in. But this machine goes beyond that with an interesting presence sensor. If you activate the presence sensor, it will notice when you get up and walk away from your laptop, locking the laptop—which is great for both security and battery life. And when you sit down in front of the laptop, the presence sensor will activate the laptop and sign you back in with Windows Hello. It's a nice feature, and it's something Microsoft's Surface Laptop doesn't offer.

CONNECTIVITY

The Lenovo Yoga Slim 7x's selection of ports feels simultaneously generous and skimpy.

If you're looking for USB-C ports, it's generous: You're getting three USB-C ports, two on the left side of the laptop and one on the right side. They're all USB-C Full-Function ports with USB4 Gen 3, Power Delivery 3.1, and DisplayPort 1.4. You will have to plug the charger into one of them to charge this machine, but you still have two USB-C ports to play with while it's charging before you even have to think about a dongle.

That's it, though. There are no other ports here: Not even a traditional audio jack or single USB-A port, and certainly not a microSD card reader or an HDMI port.

That's fine if you're willing to go all-in on USB-C! But it's worth noting that some of these Snapdragon X Elite–powered Copilot+ laptops do offer more ports, so you do have the option of getting them along with this new Arm hardware. Asus' larger Asus

The selection of ports feels simultaneously generous and skimpy.

Vivobook S 15 (fave.co/3zBBmQH), for example, includes USB Type-A, an audio jack, HDMI out, and a microSD card reader.

The Lenovo Yoga Slim 7x includes Wi-Fi 7 support (fave.co/3rPd820) along with Bluetooth 5.4-capable hardware. The laptop's Wi-Fi performed well, although I don't have a Wi-Fi 7 network to test the latest standard on yet.

Lenovo lists Bluetooth 5.3 on this laptop's spec sheet, but a Lenovo representative tells me that the company is a little conservative—other companies may list Bluetooth 5.4, as the hardware is capable of it, even though Windows doesn't yet deliver it. Rest assured this laptop has just as much Bluetooth 5.4 capability as any other Snapdragon X Elite–powered laptop.

WHAT ABOUT APPLICATION COMPATIBILITY?

Windows on Arm's application compatibility is now very good—but not perfect.

Remember: We're talking about a major architectural shift for Windows here. These Snapdragon X Elite–powered laptops are Windows on Arm PCs that can run traditional x86 Windows applications through a Prism translation layer.

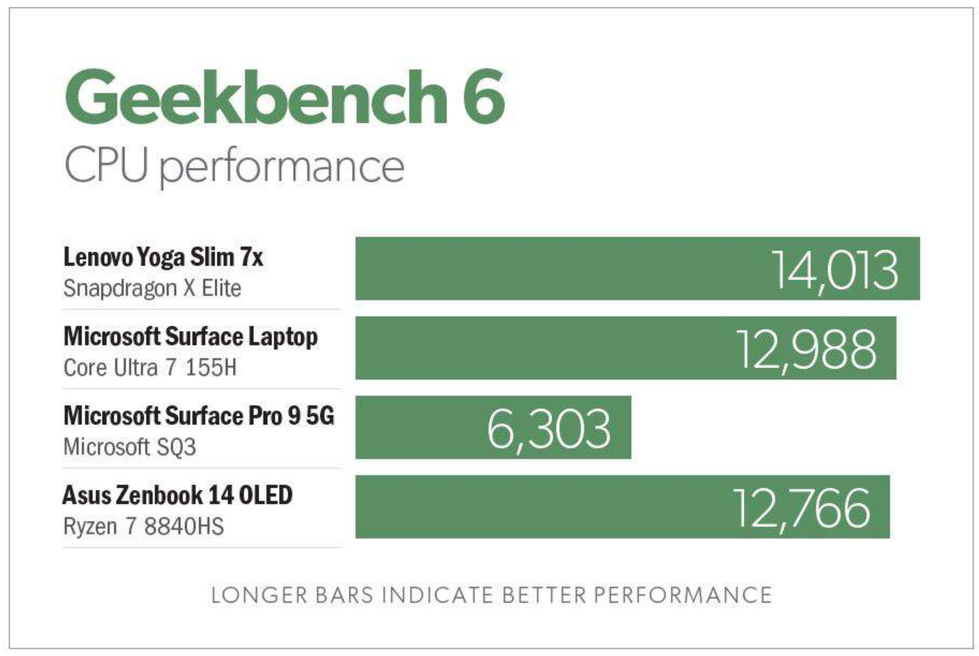
For the most part, applications "just work" (fave.co/3zDBwau)—either because they have a native Arm version already available or because the x86 version runs through Prism. If it does "just work," you don't have to think about it.

But not *everything* works. Some applications will show errors and refuse to install. For example, the official Google Drive sync tool doesn't work on these machines. It has to integrate with File Explorer, and it can't do that through the Prism translation layer. Google hasn't ported it to Windows on Arm yet (fave.co/46dOrfu).

Applications that need low-level access will be a problem in general. If you have a very old printer lying around that needs a manufacturer printer driver, for example, that traditional printer driver was likely created only for x86 versions of Windows. It likely won't work on an Arm-powered laptop.

While PC gaming has been a focus of Qualcomm's marketing (fave.co/3Wo69td), Microsoft says productivity applications will

work better than PC games (fave.co/3Y2oyNC). The Windows on Arm Ready Software website (fave.co/3SaMNFD) attempts to catalog PC game compatibility, and it notes that Fortnite doesn't run at all on these machines thanks to anti-cheat support. That's just one example: Wide game compatibility isn't here yet.



PERFORMANCE

The Lenovo Yoga Slim 7x delivered very snappy day-to-day performance while running on battery power in typical desktop applications, including web browsers like Edge, Chrome, and Firefox (fave.co/464jc6g), as well as popular productivity applications like the Microsoft Office suite and Slack. While this laptop has fans for active cooling, it stayed cool and quiet in normal use.

We ran the Lenovo Yoga Slim 7x through our standard benchmarks (fave.co/4cjKcl4) to see how it performs.

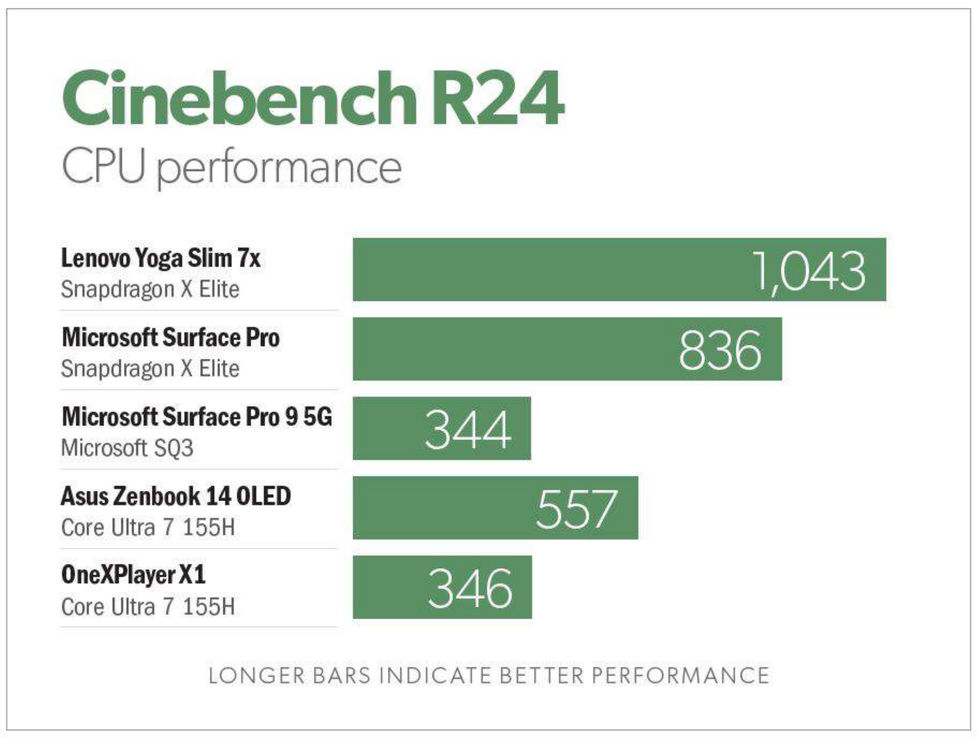
First, we ran a CPU benchmark with Geekbench 6. We normally run PCMark 10, but it doesn't run on Arm computers like this one. Geekbench 6 runs natively on ARM, so we can get an idea of this machine's CPU performance when running native Arm code without Microsoft's Prism translation layer involved.

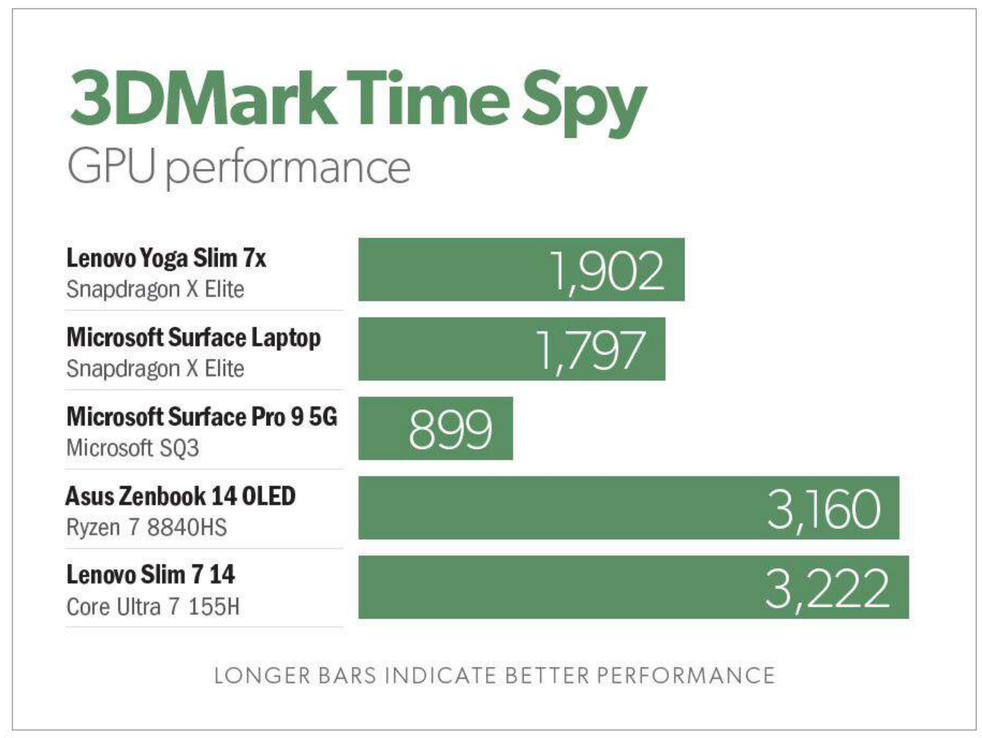
The Lenovo Yoga Slim 7x delivered an excellent score of 14013 in the multi-threaded CPU benchmark, beating both the Snapdragon X Elite–powered Microsoft Surface laptop and the Asus Zenbook 14 OLED (fave.co/4bQ3Eo2) with its Ryzen hardware. You can see the huge improvement from the older Arm-based Microsoft SQ3 processors in the Microsoft Surface Pro 9 (fave.co/3ghcbtC).

The fans stayed nice and quiet while this benchmark was running.

Next, we run Cinebench R24. Cinebench R24 has a native Arm version, which means it isn't running through the Prism translation layer. This is a heavily multithreaded benchmark that focuses on overall CPU performance. It's a quick benchmark, so cooling under extended workloads isn't a factor. But, since it's heavily multithreaded, CPUs with more cores have a huge advantage.

The Lenovo Yoga Slim 7x delivered a score of 1023 in the multi-threaded benchmark, beating all the older machines we compared it to. It's faster than recent Intel Meteor Lake CPUs here — in fact, it's even





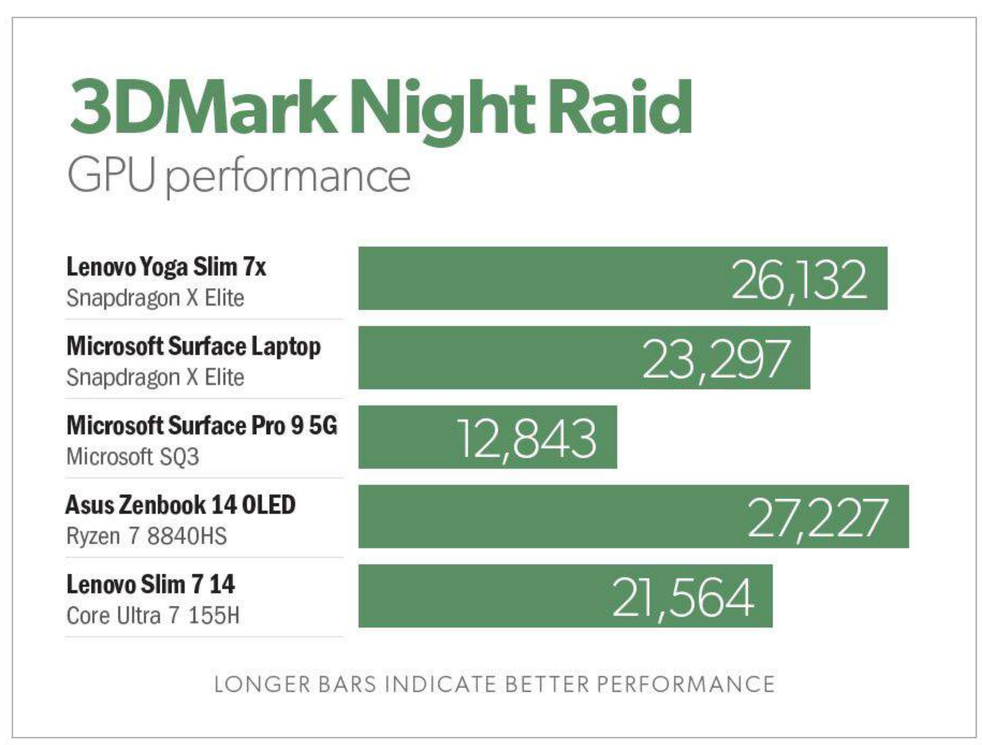
noticeably faster than Microsoft's Surface Pro 2-in-1.

The fans spun up while this multi-threaded benchmark was running — they kick in to provide extra cooling for intensive workloads like this one. (I didn't notice them running much at all during day-to-day application use.) While Snapdragon X Elite laptops deliver cool and quiet operation in day-to-day use, they will run hotter and louder while performing CPU-intensive tasks.

Next, we run a graphical benchmark. Despite Qualcomm talking a lot about gaming performance, this isn't really a gaming laptop (fave.co/4dEHNIK). It's a laptop that can run some games in a pinch, but Microsoft says compatibility will be better with productivity applications than games. As always, we run 3DMark Time Spy, a graphical benchmark that focuses on GPU performance. We also run 3DMark Night Raid.

Time Spy is running through the Prism translation layer, while Night Raid is running natively on Arm. The pair of results shows the difference between x86 code translated with Prism and native Arm code.

The Yoga Slim 7x delivered a score of 1902 in the Time Spy benchmark. That's faster than the Surface Laptop, once again. It's noticeably slower than recent Intel and AMD chips. While Qualcomm is talking up gaming performance of existing PC games that haven't been ported to ARM, one of the tricks it depends on is Auto Super Resolution (fave.



co/493fj1w), which uses the NPU to upgrade the image. That trick isn't available to this laptop in this benchmark.

When we ran the Night Raid benchmark, which runs natively on Arm, the Qualcomm Adreno GPU shot past the Intel Arc graphics in the Lenovo Slim 7 14, coming a close second to the AMD Radeon 780M graphics. While Prism works well, it's clear these machines will perform best when running native Arm code.

While these graphical benchmarks hit the Yoga Slim 7x's Qualcomm Adreno GPU hard, the laptop's fans weren't especially loud while they were running. The GPU can deliver its performance without a lot of noise or heat.

Overall, the performance was impressive. It's exactly what I'd hoped to see: Nice snappy performance in desktop applications with competitive performance in traditional x86 applications running through the Prism translation layer. This machine also delivered slightly better performance than the Surface Laptop and Surface Pro across our benchmarks.

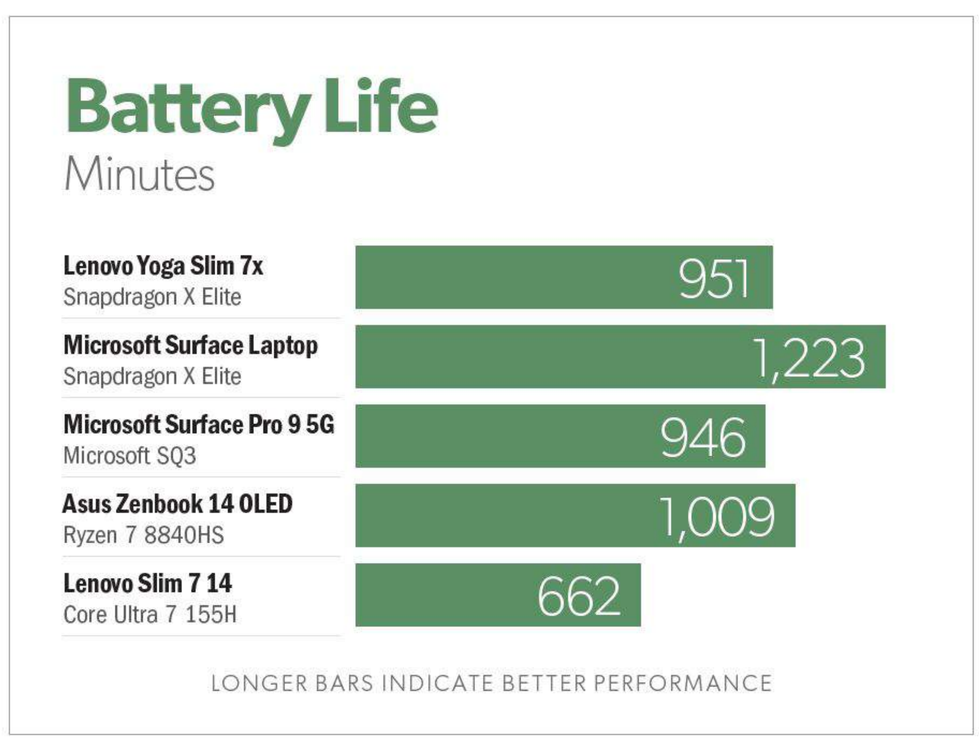
However, despite all the hype about gaming performance, I wouldn't buy a Snapdragon X Elite with gaming in mind (fave.co/3Sb779H). Not all games run — and I was surprised to see that even Microsoft's own Game Pass service for PCs won't let you install PC games on these computers. It only offers the ability to stream Xbox games from the cloud. If these machines are great at running games, Microsoft's Xbox team certainly hasn't gotten the message yet.

For now, you'll want a more traditional gaming laptop for maximum compatibility and maximum performance.

BATTERY LIFE

The entire industry has been talking up the battery life of these Snapdragon X Elite–powered laptops. Lenovo says the Yoga Slim 7x has "multiday battery life," which the company describes as two 8-hour workdays of mixed workloads. Additionally, Lenovo says this machine has Rapid Charge Express technology and can get up to 3 hours of runtime in 15 minutes of charging time, and it seemed to charge nice and fast.

With a battery-sipping Snapdragon X Elite chip and a 70 watt-hour battery, it should get decent battery life. We saw incredible battery life for a laptop with an OLED screen, although it's not as much battery life as Microsoft's Surface Laptop with its more energy-efficient display.



To benchmark the battery life, we play a 4K copy of *Tears of Steel* on repeat in the Media Player app on Windows 11 with airplane mode enabled until the laptop suspends itself. We set the screen to 250 nits of brightness for our battery benchmarks, and it's worth noting that OLED laptops have a bit of an advantage, as OLED screens use less power to display the black bars around the video. This is a best-case scenario for any laptop since local video playback is so efficient, and real battery life in day-to-day use is always going to be less than this.

The Lenovo Yoga Slim 7x lasted for an average of 951 minutes, which is a tad under 16 hours. That's a truly incredible number for a laptop with an OLED display. In real use, too, the laptop delivered snappy performance in day-to-day computer usage—applications like Chrome, Edge, video meetings, Microsoft Office, and Slack—while the battery level dropped much slower than it would on the typical Intel or AMD laptop I've been reviewing.

Of course, that 14.5-inch OLED display is draining the battery a bit faster. Microsoft's Surface Laptop beat this laptop in our benchmarks with an extra four hours of battery life—all while having a smaller 54 watt-hour battery. If you're looking for the longest possible battery life, you'll likely want to look elsewhere. But you'll be getting a less vibrant display. The trade-off is up to you—but with battery life this good, sacrificing a little bit of it for a more beautiful OLED display feels like a reasonable move.

The Yoga Slim 7x is a great laptop for day-to-day use with typical desktop applications.

BOTTOM LINE

The Lenovo Yoga Slim 7x is a great laptop for day-to-day use with typical desktop applications. It offers nice, snappy performance even on battery power. Thanks to the incredible energy efficiency of the Snapdragon X Elite hardware and the reasonably large 70 Watt-hour battery in this machine, this PC gets great battery life—even though it has a high-resolution OLED display.

If you're interested in this machine, you're likely in one of two situations:

The Lenovo Yoga Slim 7x is a beautiful machine.

First, you may be curious about Snapdragon X Elite PCs in general. If so, you should do some research to see whether the applications you depend on run on Snapdragon X Elite PCs in general. The lack of Google Drive will be a big deal for some people—and that's just one example. PC game compatibility isn't perfect, either. Intel's Lunar Lake (fave.co/4f6zIH1) may deliver an experience more like this one with full x86 compatibility later this year. But if the applications you do rely on work on this hardware and you're interested in the excellent day-to-day performance with long battery life without waiting to see Intel's next hardware release, I think you'll be happy with one.

Second, you might be comparing the various Snapdragon X Elite Copilot+ PCs available now. Compared to a Surface Laptop (see page 94), for example, this machine trades some of that battery life for a big and beautiful OLED display. And it offers a good deal if you want more RAM and storage. If maximum battery life is all that's important to you, look elsewhere—like the Surface Laptop. If you want more ports, like USB-A, HDMI, or a headphone jack, this also isn't the machine for you.

Ultimately, the Lenovo Yoga Slim 7x is a beautiful machine. Its main problems are with software: Windows on Arm still doesn't have perfect software compatibility, and these Copilot+ PC AI features aren't all they're hyped up to be at launch. But I can't help but love this kind of performance and battery life combined with a vivid OLED display.

Lenovo Yoga Slim 7x

★★★★½

PROS
- Amazing battery life.
- Beautiful OLED screen.
- Great pricing on RAM and storage upgrades.

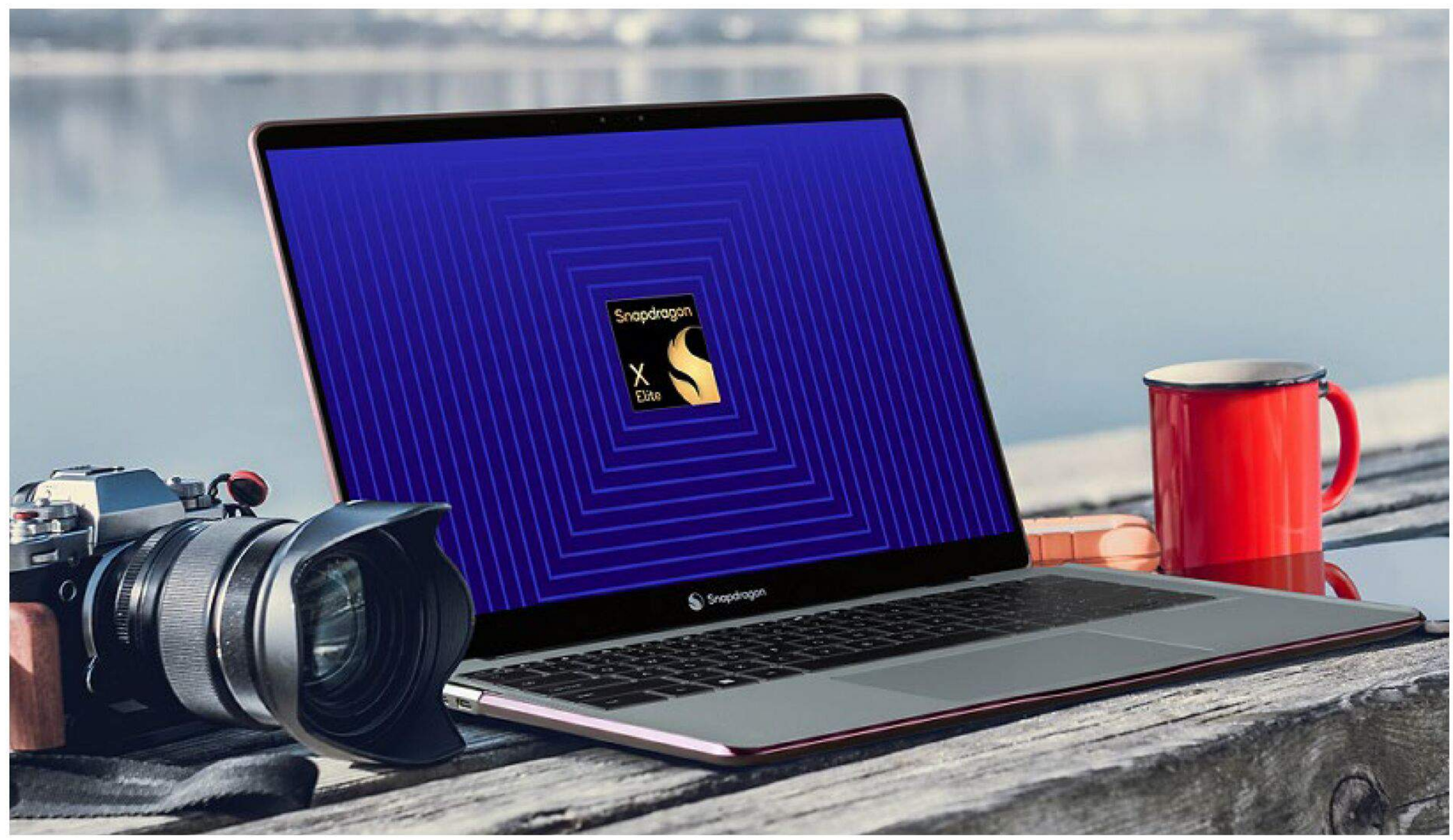
CONS
- No headphone jack or USB-A port.
- Windows on Arm app compatibility isn't perfect.
- Yoga name is misleading as this isn't a 2-in-1.
- Copilot+ PC AI features are half-baked.

BOTTOM LINE
This Snapdragon X Elite–powered laptop combines a beautiful 14.5-inch OLED display with long battery life. But Snapdragon laptops without an OLED screen will get even longer battery life, and application compatibility still isn't perfect on these new Arm PCs.

From $1,199

Tested: Don't buy a Snapdragon X Elite laptop for PC gaming

How does Qualcomm's Snapdragon X integrated GPU fare against Intel's Arc graphics? We tested and compared both. **BY MATTHEW S. SMITH**



2024 is an exciting year for Windows. While the AI features touted by Microsoft's Copilot+ PCs are a flat miss (fave.co/4f3NQkw), the new Qualcomm Snapdragon X Elite hardware inside Copilot+ PCs is a definite win.

Finally, after more than a decade of effort, Windows on Arm is a viable alternative to traditional x86 processors—and it's especially alluring if you long for longer battery life.

But what about games? There's reason to be skeptical, despite Qualcomm's pre-release claims that games should just work on Snapdragon X Elite (fave.co/4f2Waku). Games are often developed with a highly specific platform target. Even ports that seem simple, like a move from PlayStation 5 to Xbox Series X|S, can take a lot more effort than you might think.

To find out how well Qualcomm's chips fare in PC games, I pitted Microsoft's new

IMAGE: QUALCOMM

Surface Laptop 7 against a Dell Inspiron 14 Plus 2-in-1 with an Intel Core Ultra processor and Intel Arc integrated graphics. The results are shocking.

QUALCOMM VERSUS INTEL INTEGRATED GPUS

Every Qualcomm Snapdragon X chip comes with an integrated Qualcomm Adreno X1 GPU, though the IGP's performance varies a bit depending on the particular Snapdragon X chip in a device:

- Snapdragon X Plus X1P-64-100: 3.8 TFLOPs
- Snapdragon X Elite X1E-78-100: 3.8 TFLOPs
- Snapdragon X Elite X1E-80-100: 3.8 TFLOPs
- Snapdragon X Elite X1E-84-100: 4.6 TFLOPs

As you can see, Qualcomm's naming conventions are a bit opaque even by the standards of the industry, so you'll need to pay close attention when buying a Qualcomm-powered Windows laptop.

Though the X1E-84-100 is the best Qualcomm chip, it's currently exclusive to the Samsung Galaxy Book4 Edge, leaving the X1E-80-100 in the leading spot for most Qualcomm-powered laptops. This is the chip I'll be using in my tests for this comparison.

Intel, meanwhile, provides integrated Arc graphics into some—though not all—Intel Core Ultra chips (fave.co/4dI9Eqf). Here, too, the details can vary quite a bit between chips. The least performant have four Xe Cores, while the best have eight. Clock speeds vary, too.

Intel's Core Ultra 7 155H, the one I'll be using for this comparison, is a popular option for thin-and-light Windows x86 laptops, the form factor Qualcomm targets with its debut Snapdragon notebooks. Many expensive laptops use it for their entry-level configurations, while mid-range laptops provide it as an upgrade over an Intel Core Ultra 5.

GAMES THAT FAILED

Before diving into benchmarks, I want to address a major problem upfront: Most games currently make little or no effort to support Qualcomm's hardware.

Qualcomm tried to build pre-launch hype with demonstrations of *Baldur's Gate 3* and *Control*, which both launch and run on a Snapdragon X laptop. However, many of the games I tried refused to launch, crashed at launch, or had instability problems that made them unplayable.

The list of game titles with such problems include many of the most popular games on Steam:

PUBG: Battlegrounds has an anti-cheat system that doesn't currently support Qualcomm's hardware, so the game refused to launch.

Counter-Strike 2 launched and at first seemed playable. However, the game

frequently locked up for seconds at a time. The lock-ups seemed to be triggered by gunfire, which obviously isn't great in a fast-paced esports shooter.

Warframe launched to the title and login screens, but opened in an oddly scaled window that made the login button unavailable. The game crashed when I resized or maximized the window.

Many of the games I tried to launch failed, including *Valheim* (pictured).

Apex: Legends politely refused to launch. The game produced an error message stating that Arm chips aren't supported.

Diablo IV launched and I was able to enter a game, but the game froze several seconds after I started moving my character, followed by a "[Prism] Device Removal – Win10/Dx12 TQ0 RT0 DLSS0 FG0" error message.

Valheim crashed to the desktop before the game loaded to the start screen. This happened under both DirectX and Vulkan.

As I discovered in my time using the Microsoft Surface Laptop (see page 47), Qualcomm's Snapdragon X delivers a stable Windows software experience straight out of the box. From web browsers to video editors, nearly everything ran without a problem. And to my surprise, a large majority of the apps I use for everyday work already support Arm.

But PC games are a different beast. Very few PC developers bother to create Arm-compatible versions of their game. That's when emulation tries to step in, but emulating a game is more difficult than emulating a typical desktop application.

Can Intel Arc play these titles? For the most part, yes. Games like *Warframe* and *Counter-Strike 2* are very playable on Arc. Others, like *Diablo IV* and *PUBG: Battlegrounds*, push the definition of playable with occasional hitches or stutters, but I suspect gamers who aren't too critical of performance will still find the gaming experience tolerable.

THE LAPTOPS USED FOR COMPARISON

I went beyond PCWorld's typical benchmarks for this comparison because I'm interested in a broader overview of how Qualcomm's Adreno X1 and Intel's Arc compare across different games of varying age, graphical fidelity, and genre.

Because of that, I had to test a competitive laptop with Intel Arc graphics side-by-side with the Qualcomm machine. I selected the **Dell Inspiron 14 Plus 2-in-1 with an Intel Core Ultra 7 155H** and I pitted it against the new **Microsoft Surface Laptop 7 with Qualcomm X1E-80-100**.

Both laptops have (roughly) 14-inch screens, and they're similar in size and weight, so neither has an innate thermal advantage. They represent many mid- to high-end laptops with Qualcomm or Intel hardware.

The laptops were set to their respective Best Performance modes for these tests. I ran all benchmarks three times and averaged the results. Both laptops were connected to power.

THE GAMES TESTED AND THEIR RESULTS

Sid Meier's Civilization VI

Firaxis' *Sid Meier's Civilization IV*, released in 2014, is hardly a new game, but it remains among the most popular grand strategy games on Steam. It's a great game to test because large games like this, with many AI opponents, can still tax entry-level laptops.

I tested this game with the built-in *Gathering Storm* expansion benchmark at 1920×1080 resolution with low Performance and Memory graphics presets selected. The benchmark ran three times back-to-back and the results were averaged. The DirectX 12 mode was used.

Microsoft Surface Laptop with Qualcomm Adreno X1:

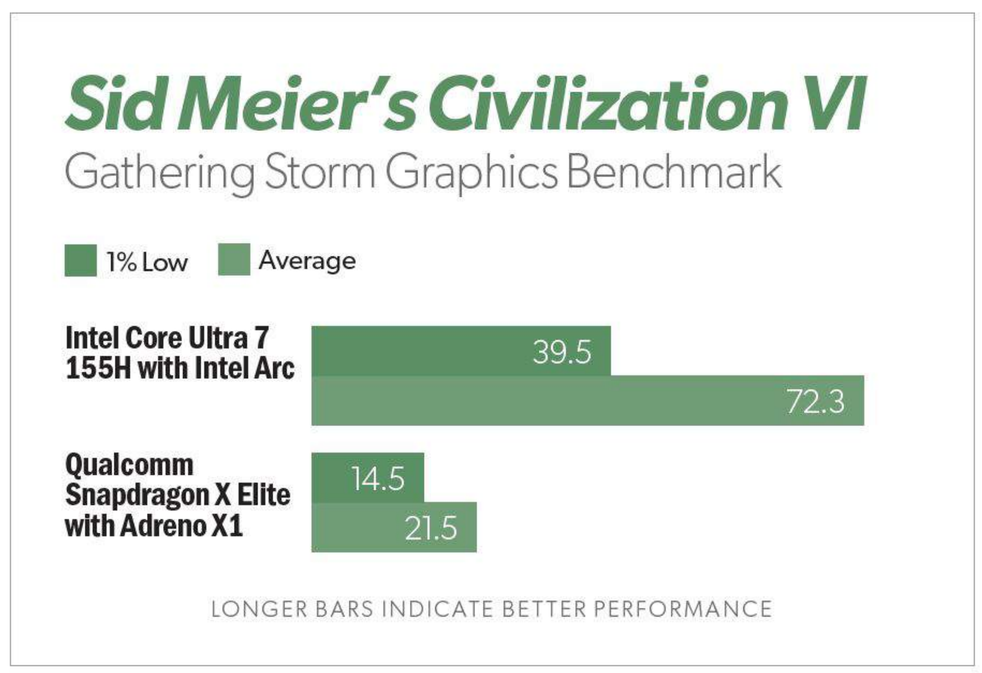
Average 21.47/1% Low 14.52

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

Average 72.29/1% Low 39.52

This is a blowout win for the Intel Arc graphics, which averaged a performance uplift of roughly 3.5 times when compared to the Qualcomm Adreno X1. More importantly, the Intel Arc delivered a playable and enjoyable experience, while the Qualcomm Adreno X1 did not.

Interestingly, an Arm-native version of *Civilization VI* exists, as the game is available



for both the iPad and Nintendo Switch (both have Arm chips). However, it's not available for Windows. This implies the potential to improve performance with a native Arm release, but Firaxis hasn't announced plans to bring it to Windows on Arm.

Dota 2

Valve's *Dota 2* remains one of the most popular e-sports titles on the planet. I tested its performance using the in-game replay function to standardize the results. The game was launched at 1920×1080 resolution with the Fastest detail preset, and three 60-second snapshots of performance were captured from the same replay file.

Microsoft Surface Laptop with Qualcomm Adreno X1:

Average 52.8/1% Low 17.8/0.1% Low 9.8

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

Average 106.6/1% Low 52.6 /0.1% Low 38.1

This is a playable result for the Qualcomm chip, but only just. The average of 52.8 frames per second is solid, though not amazing, but the 1% lows dip into the high teens, and the 0.1% lows dip to single-digits. The game suffered occasional audio dropouts and glitches.

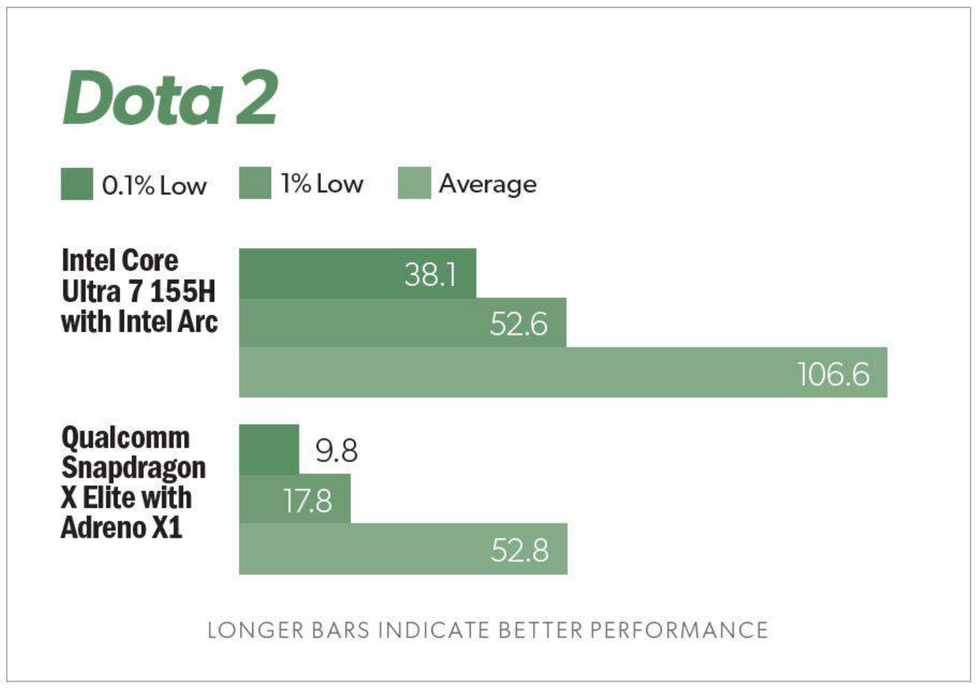
Intel Arc is both quicker and more stable. Though far from a speed demon, the Arc delivers an experience that looks and feels more polished. I think most Dota 2 players could get by with Intel Arc graphics if that was their only option.

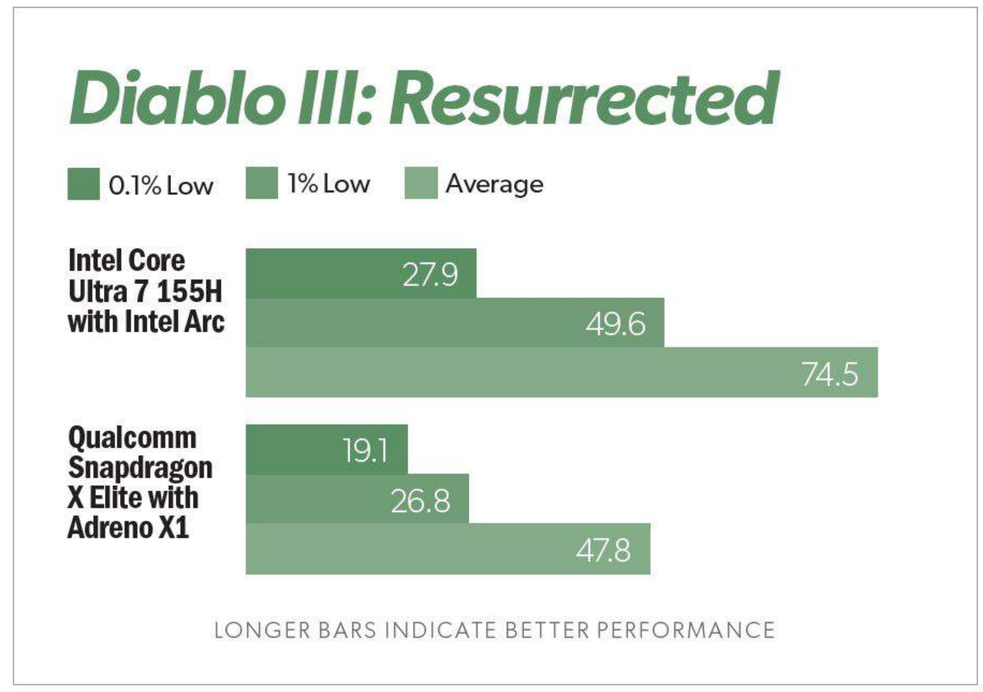
Diablo II: Resurrected

As mentioned earlier, *Diablo IV* crashed on the Qualcomm chip—so I instead gave *Diablo II: Resurrected* a spin.

Although it appears to be a 2D game at a glance due to its fixed isometric perspective, it's a full 3D title and can prove surprisingly demanding on low-end to mid-range hardware.

I tested the game at 1920×1080 resolution with the Medium detail preset. Dynamic resolution scaling was disabled. I





booted the game up, selected a high-level character, and romped through the River of Flame map on Nightmare difficulty.

Microsoft Surface Laptop with Qualcomm Adreno X1:

Average 47.8/1% Low 26.8/0.1% Low 19.1

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

Average 74.5/1% Low 49.6/0.1% Low 27.9

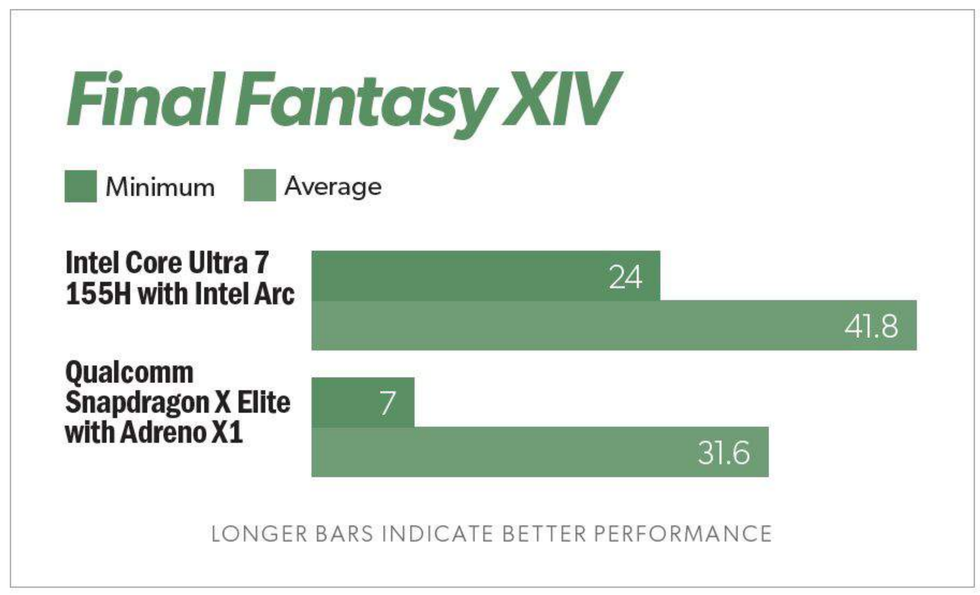
Though hardly perfect, *Diablo II: Resurrected* was playable on the Qualcomm chip. It delivered an average of about 48 frames per second and 1% lows of 26.8 frames per second, indicating that gameplay wasn't always smooth but usually good enough. I didn't notice any bugs or glitches in my time with the game, either.

Still, Intel Arc came out ahead by every metric. Not only was Arc's average framerate much higher, but its framerate dips were less severe. In practice, these numbers mean *Diablo II: Resurrected* felt smoother and more stable on the Arc system.

Final Fantasy XIV

The popular MMORPG *Final Fantasy XIV* received a graphical overhaul for its new expansion *Dawntrail*, but it's still not an especially demanding game when all things are considered.

I tested it with the standalone benchmark at 1920×1080 resolution and the High (Laptop) detail setting. Dynamic Resolution Scaling was off, while LOD on



Distant Objects and Dynamic Grass Interaction were left on.

Microsoft Surface Laptop with Qualcomm Adreno X1:

4474/Average 31.56/Minimum: 7

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

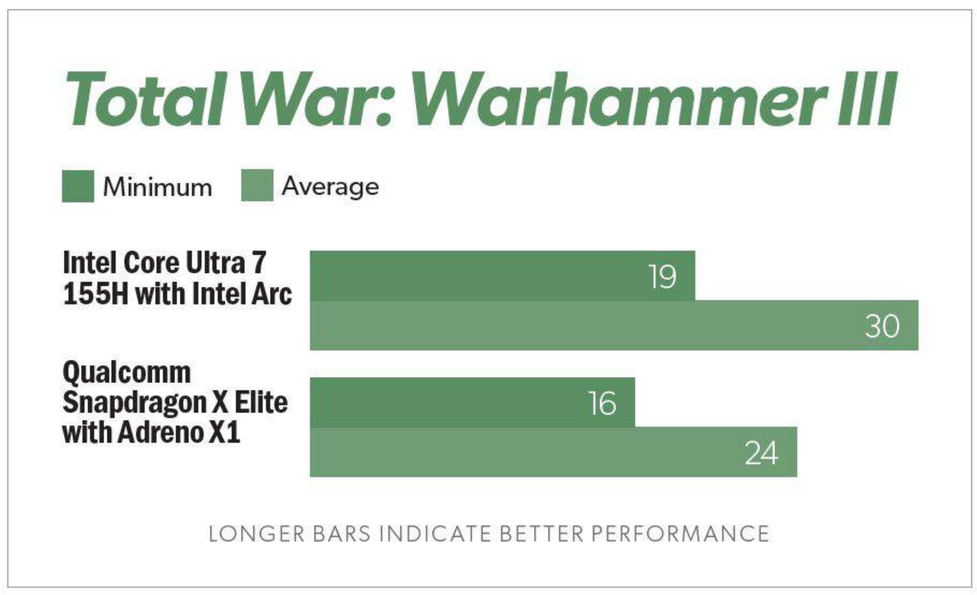
6111/Average 41.8/Minimum: 24

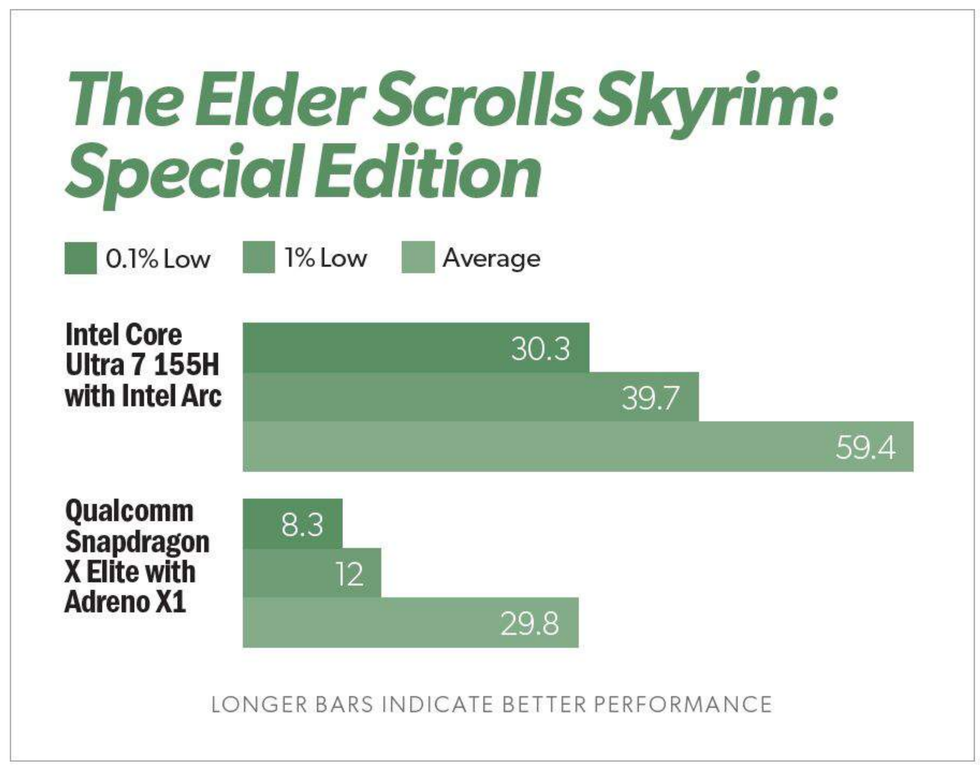
The Qualcomm chip played the game reasonably well, but it often suffered momentary framerate dips that were a drag on the visuals, while Arc's dips were relatively rare (though I would still recommend notching down a few detail settings).

This is another win for Intel Arc. While a higher average framerate is great, Arc's real victory is its superior minimum framerate result. FFXIV fans might get by with the Qualcomm chip in a pinch, but I wouldn't recommend it.

Total War: Warhammer III

Total War: Warhammer III is a real graphical showcase for strategy fans. It has detailed campaign maps and large battles that can





include thousands of units. I tested it with the built-in campaign benchmark at 1920×1080 resolution and the Low detail preset.

Microsoft Surface Laptop with Qualcomm Adreno X1:

Average 24/Minimum 16

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

Average 30/Minimum 19

Intel Arc won this comparison, but the margin of victory was far slimmer than with most of the titles I tried—and it might not matter much. While Arc did average 30 FPS, the framerate frequently dipped into the 20s.

Both Intel Arc and Qualcomm Adreno require significant resolution reductions for a truly playable experience in this title.

The Elder Scrolls V: Skyrim Special Edition

Despite its age, *Skyrim* remains an important title for PC gaming with an active community and a huge library of modifications.

I tested the Special Edition, without mods, at 1920×1080 resolution using the High detail preset. The test run was a walk from the cave you exit at the beginning of the game to the walls of Helgen.

Microsoft Surface Laptop with Qualcomm Adreno X1:

Average 29.8/1% Low 12/0.1% Low 8.3

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

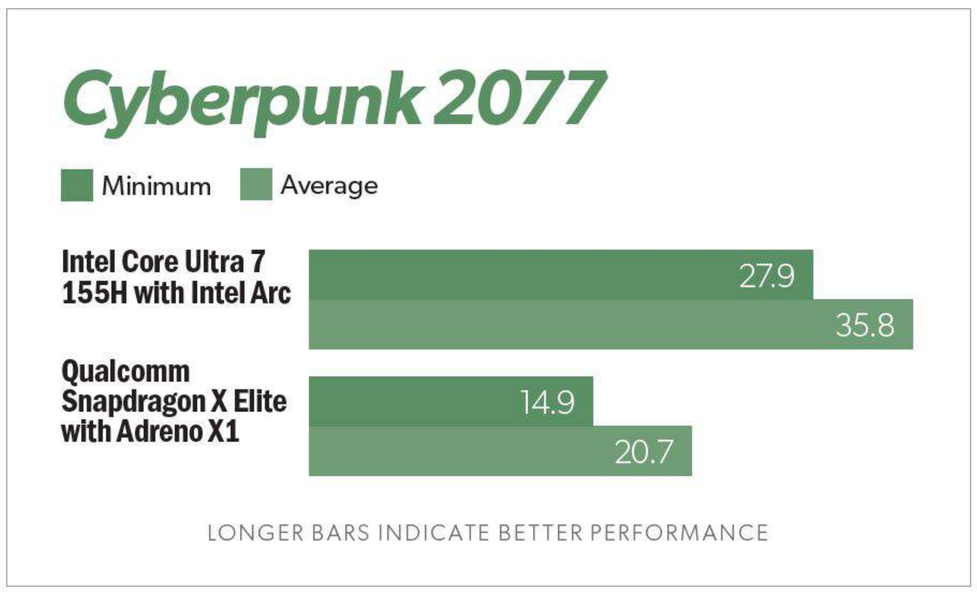
Average 59.4/1% Low 39.7/0.1% Low 30.3

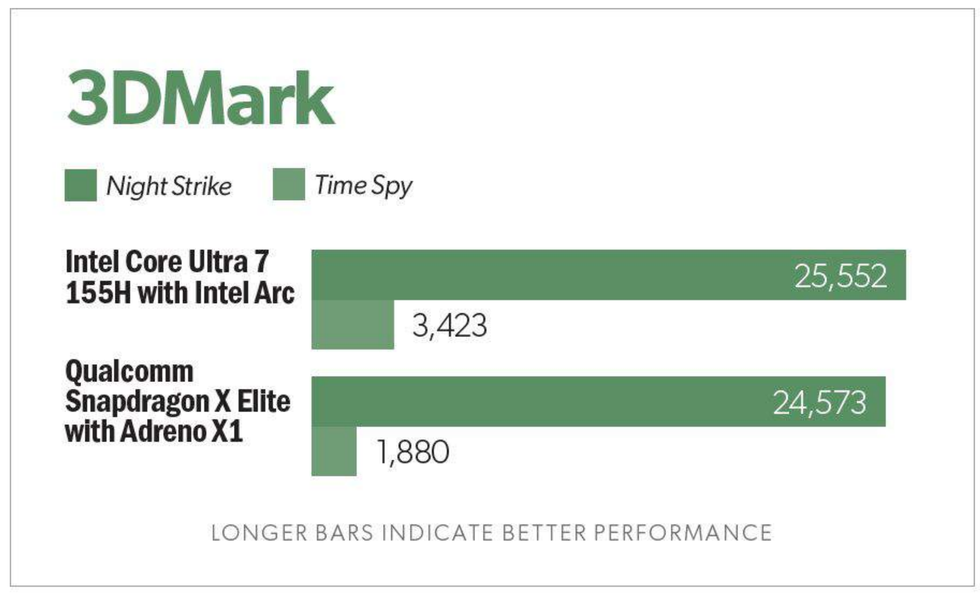
This was a clear win for Intel Arc, which roughly doubled the performance of the Qualcomm chip. Skyrim felt more stable on Arc with a 0.1% low of 30.3 frames per second, while it stuttered and hitched frequently on the Qualcomm-powered Surface with a 0.1% low of 8.3 FPS.

Cyberpunk 2077

Now we have *Cyberpunk 2077*, a notoriously demanding title that's representative of cutting-edge cross-platform games.

I ran the benchmark at 1920×1080 resolution and used the Low detail preset.





Resolution scaling was enabled because this game simply isn't playable on this class of hardware without it. The Qualcomm chip used AMD FSR 2.1 while Intel Arc used Intel XeSS 1.2. Ray tracing was off.

Microsoft Surface Laptop with Qualcomm Adreno X1:

Average 20.69/Minimum 14.93

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

Average 35.83/Minimum 27.90

This is another win for Intel Arc. *Cyberpunk 2077* is just barely playable on Arc, though, so it's a long way from ideal. On Qualcomm, meanwhile, the game's average and minimum framerates fall short of acceptable.

Reducing resolution to 720p and fine-tuning the settings can arguably provide a playable experience, but I wouldn't recommend it.

3DMark

Last but not least is a pair of 3DMark synthetic benchmarks: Time Spy and Night Strike. Time Spy is not an Arm-native test, but Night Strike is, and that has a big impact on performance.

Microsoft Surface Laptop with Qualcomm Adreno X1:

Time Spy 1,880/Night Strike 24,573

Dell Inspiron 14 Plus 2-in-1 with Intel Arc:

Time Spy 3,523/Night Strike 25,552

In Time Spy, which isn't Arm-native, the Qualcomm Adreno X1 is leagues behind Intel Arc. But in Night Strike, which does provide an Arm-native version, the two are rather close. Arc still wins, but only by a hair.

This is a very important result. While not especially useful for gamers buying a laptop today, it hints that Qualcomm hardware could end up in a much better place in due time.

Windows games designed for Arm are exceedingly rare right now, which is bad news for Qualcomm. But the Night Strike result shows that Qualcomm could make up a lot of ground if game developers begin to release updates for Windows on Arm.

Games such as *The Elder Scrolls V: Skyrim Special Edition* don't run well on Qualcomm's chip.

BOTTOM LINE

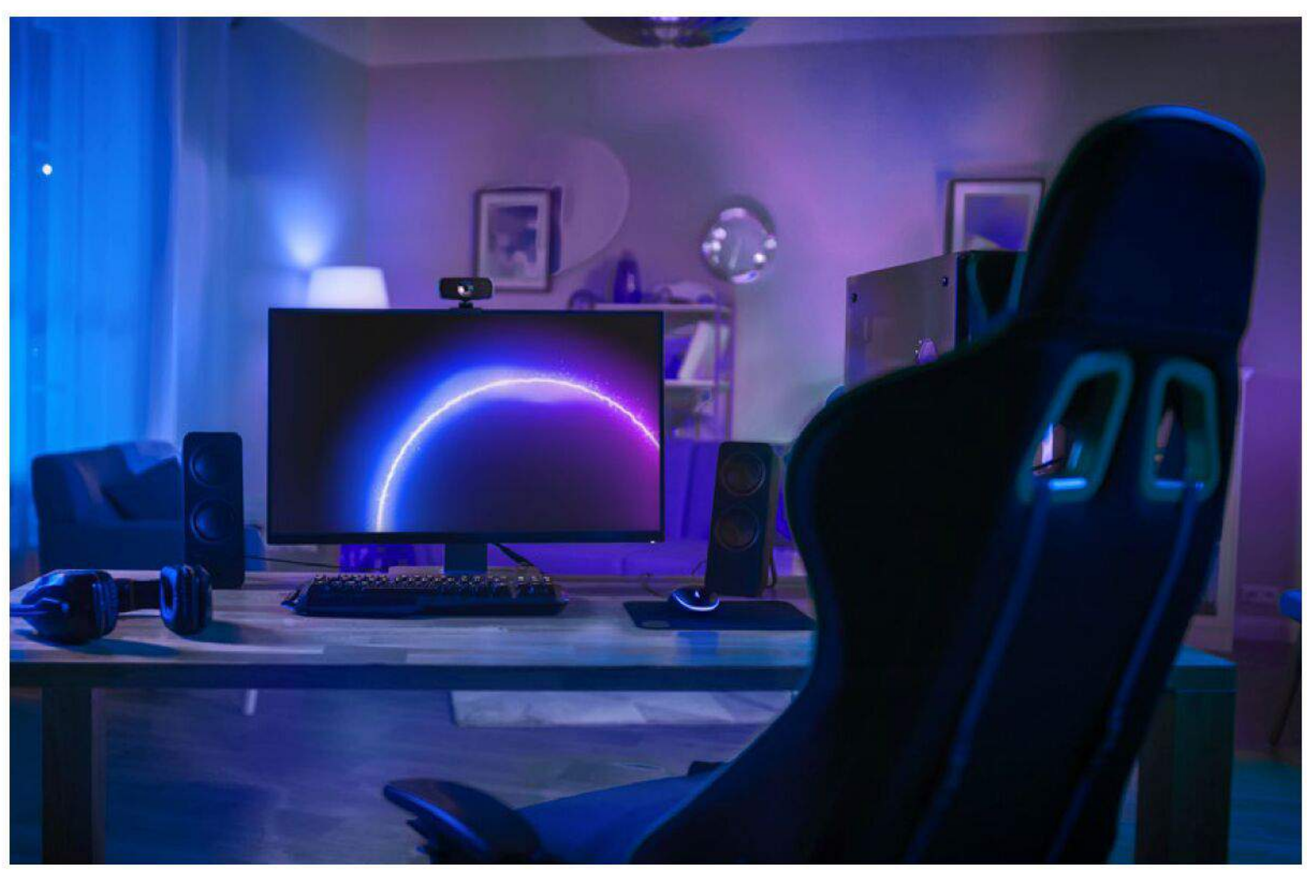
Qualcomm's big issue is the lack of Windows on Arm among the PC game development community. Unlike other software developers—who are adopting Windows on Arm at speed—PC game developers seem unmotivated and even reluctant to do so.

That's understandable. Game developers already have to think about possible support for at least six platforms (Windows x86, Mac, Linux x86, PlayStation 5, Xbox Series X|S, and Nintendo Switch). Adding Windows on Arm to the pile is surely a strain.

Still, the consequences are clear. Modern games simply don't run well on Qualcomm's chip because they generally run emulated, not natively. As a result, many titles experience hitching, stuttering, and/or extended framerate drops that drag down the experience with instability.

This could all change as game developers begin to release Arm-native versions, but I can't predict how quickly that change will come.

So what's the final takeaway? If you're looking to play PC games on an entry-level laptop today, you should choose an Intel laptop with Arc integrated graphics (or an AMD Ryzen laptop) over a Qualcomm alternative.



If you're looking to play PC games on an entry-level laptop today, you should choose an Intel laptop with Arc integrated graphics.

Malwarebytes Premium Security: An anti-malware staple is now optional

This app can be a good option for those who want dead-simple antivirus software.

BY ALAINA YEE

Malwarebytes was once a crucial piece of software—a necessary supplement for your main antivirus scanner. You couldn't always count on just one program to catch everything, and Malwarebytes rose to prominence as a reliable secondary tool.

But the world has changed since 2010 (fave.co/4c1hAMh). Now if you run multiple antivirus apps, you could open yourself up to software conflicts or increased risk for system

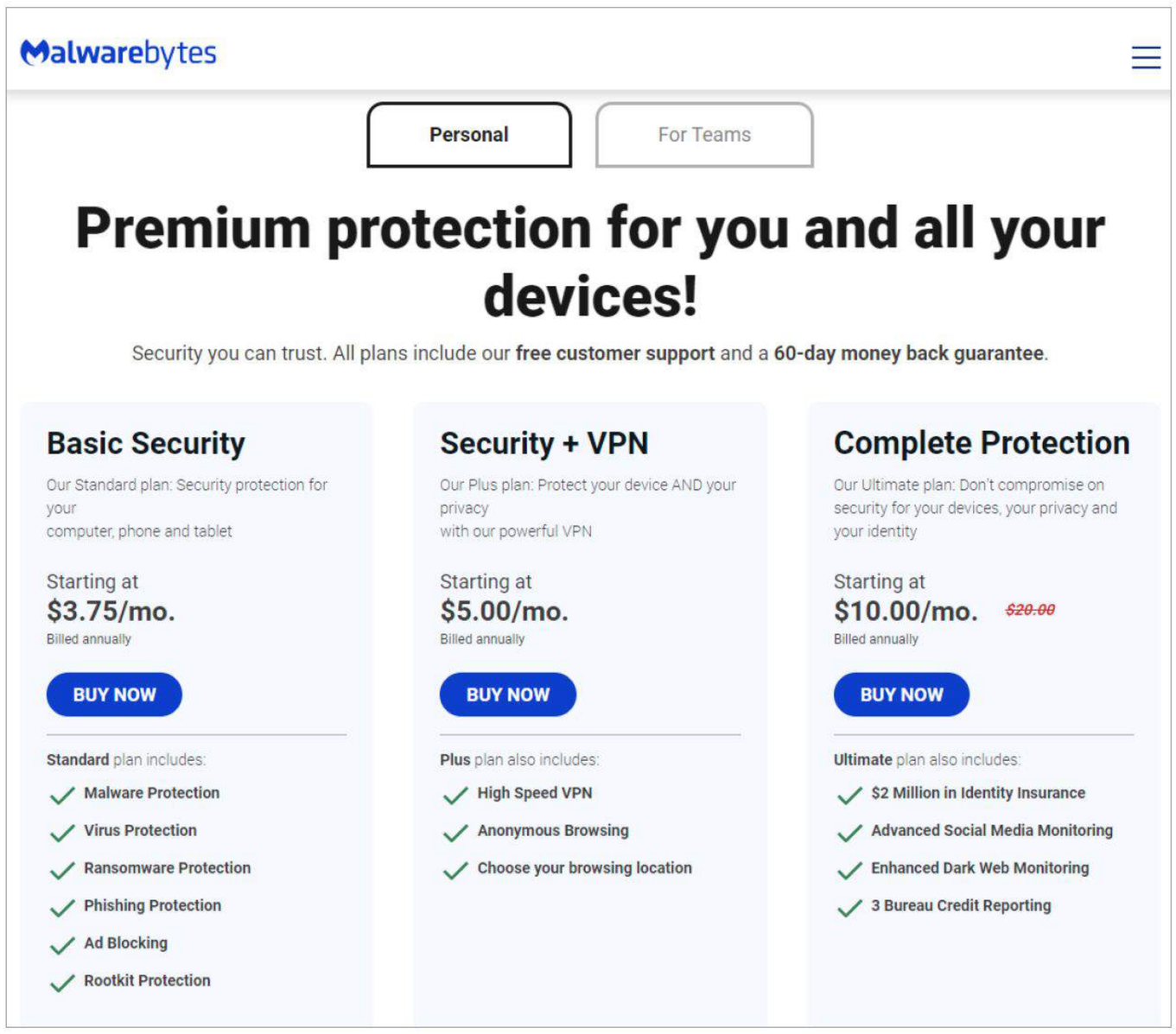
IMAGE: FOUNDRY

vulnerabilities. One single program is the way to go—and if you're a newbie to security and prefer a dead-simple app, then Malwarebytes' streamlined, elegant approach can fit the bill.

PRICE

As a simple suite, Malwarebytes Premium Security costs $60 per year. New subscribers can sign up for a two-year package to save $9 ($111 total). Unlike most other antivirus vendors, Malwarebytes bills in monthly installments over a 12-month term, rather than charging the total cost upfront.

For its consumer products, the company offers a 14-day trial and a 60-day money-back guarantee (fave.co/3zFXnOy).



Malwarebytes has a range of plans to choose from.

Single-device plan (3 devices)

- $60 per year (billed monthly over a 12-month term)

Malwarebytes' plan allows you to spread your device allotment over those running Windows, macOS, Android, iOS, and ChromeOS.

If you want to cover more gear or save a little more cash, you can get licenses for Malwarebytes through third parties like Amazon (fave.co/4d00r6o) and the PCWorld Software store (fave.co/4cHtDzk), with more-flexible terms and at lower rates. However, such plans currently don't include VPN service, which Malwarebytes added to the subscriptions it sells directly.

WHAT DOES MALWAREBYTES PREMIUM SECURITY INCLUDE?

When you step up from Malwarebytes' free version to a paid subscription, real-time monitoring for malware, email, web, and select network threats becomes active. (The free plan only scans if you initiate a manual check.) Overall, you're protected against

viruses, ransomware, and other malware, as well as other common attacks like phishing attempts, zero-day exploits on the web and over email, and suspicious apps.

Choosing Malwarebytes Premium Security adds on access to the company's VPN, which Malwarebytes advertises as a no-log service (fave.co/46enUyv). As premium upgrades go, this one is simplistic—you don't get parental controls, a password manager, additional defenses like protected folders, or PC utilities, as you do with a rival like AVG (fave.co/3PdHNfV). The company seems to weigh its VPN service as equally valuable to a collection of such antivirus features.

KEY FEATURES

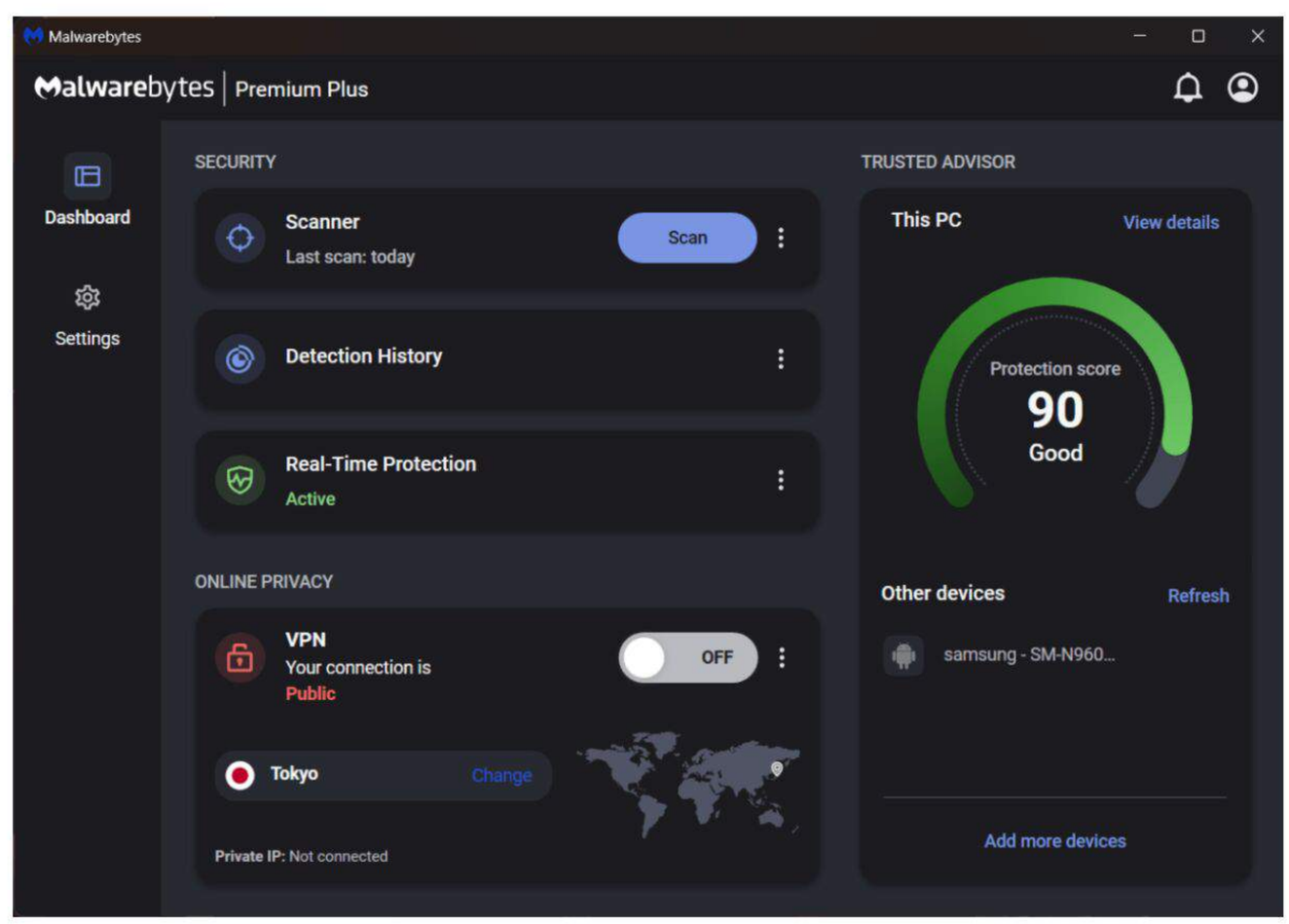
Installation and user interface

After you install the app, you'll see the main dashboard. The interface is incredibly streamlined, with just two tabs on the left navbar—Dashboard and Settings. You can choose between Light, Dark, or matching Windows mode.

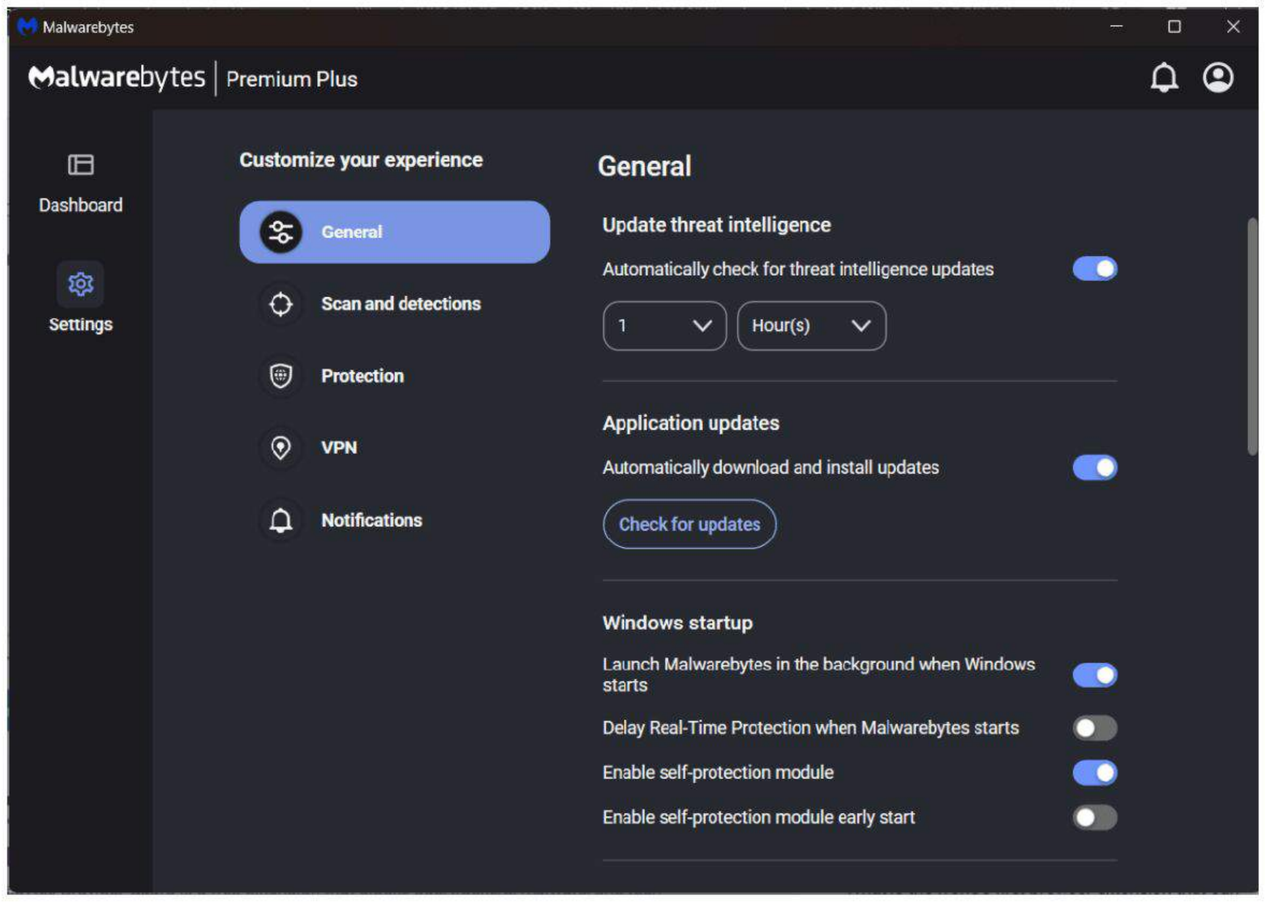
Accordingly, you'll send almost all your time on the Dashboard view, which is divided into three segments. In the larger one, you'll see a couple of sections blocked out. At the upper left is Security, with Scanner, Detection History, and Real-Time Protection as the three options and their settings:

- **Scanner** lets you run a quick, full, or custom scan, as well as jump directly to related settings. You can also access the scheduled scans to review what's already set up and create new ones.
- **Detection History** shows quarantined items, the history of events (like detected viruses), and your allow list—items that you've approved as safe after initially being flagged by Malwarebytes.
- **Real-Time Protection** is not so much a feature as it is an explanation for how Malwarebytes works and how it goes about safeguarding your PC continuously.

Directly underneath the security section is one for the VPN. It puts the major controls at your fingertips, letting you quickly activate the service and change the location. You can also jump into related settings.



You'll spend almost all your time on the Dashboard view.



The interface is clean and simple, as are the settings for the app and its features.

Along the right side is a rating for your PC's protection level—Malwarebyte's assessment of how close you are to utilizing the app fully. You can also check on other devices associated with your account.

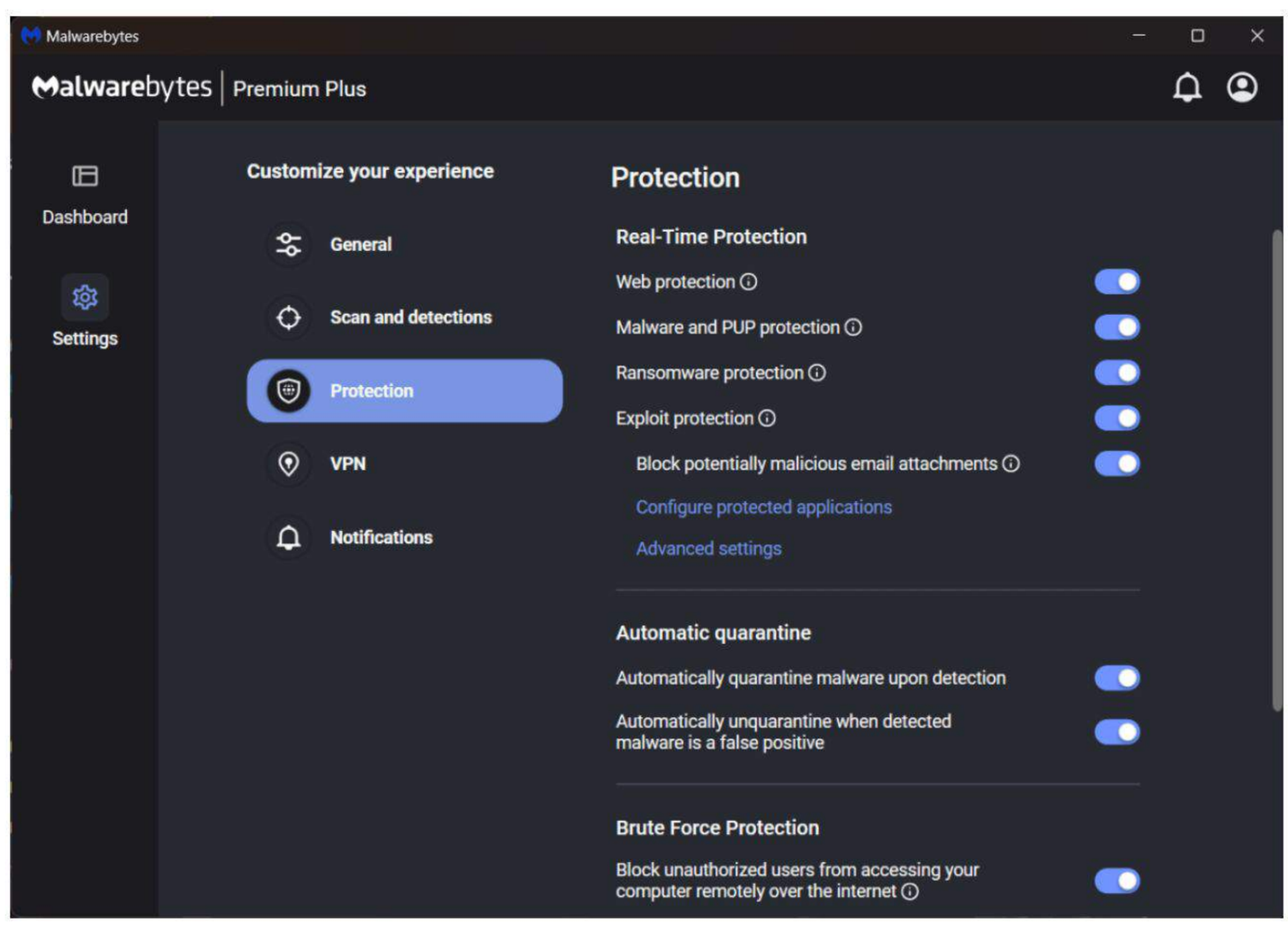
Generally, the interface is clean and simple, as are the settings for the app and its features. The only area where you can dig in deeper are the antivirus protection settings—but as Malwarebytes rightly warns, nearly all users are better off leaving the defaults as they are.

One tip: Once the software is installed, head to Settings > Notifications, scroll down to the bottom, and turn off marketing notifications.

Virus, malware, and threat protection

Real-time protection

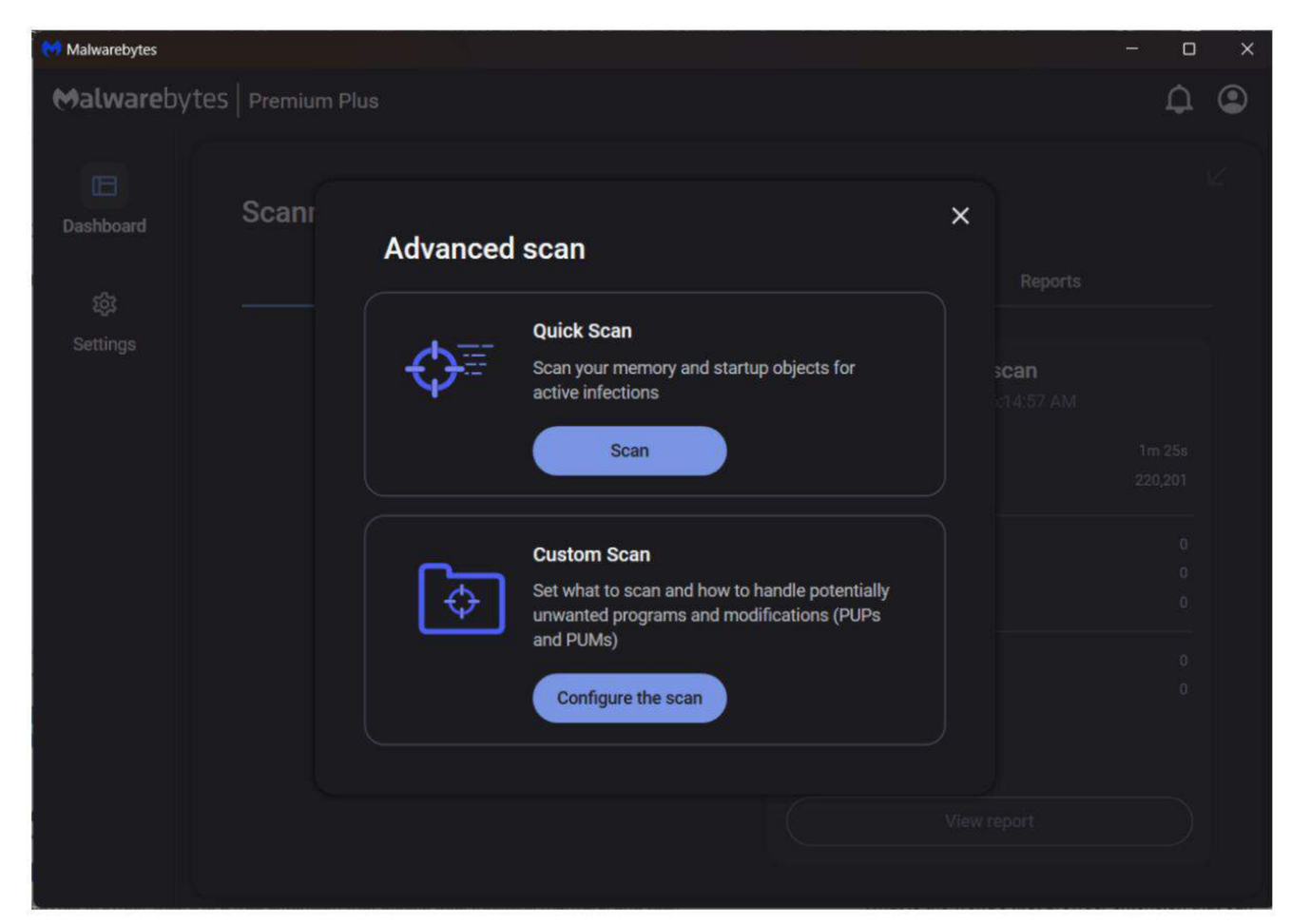
Malwarebytes Premium Security constantly keeps an eye out for a variety of threats. When you're opening or adding files, using apps, or browsing the web, it will block viruses, ransomware, and other malware such as rootkits, along with any phishing attempts.



If you want to adjust your real-time scanning settings, you can change what the app screens for and how stringent it is with its filters.

Unlike other rivals, Malwarebytes doesn't offer a firewall. That job is left to Windows. It also doesn't offer additional protections against dangers like DNS hijacking and webcam takeovers. As for identity protection, like dark web monitoring and insurance coverage, you must upgrade to the company's Complete Protection plan, which costs twice as much per year.

If you want to adjust your real-time scanning settings, you can change what the app screens for and how stringent it is with its filters, as well as how it handles suspicious files. Malwarebytes allows you to dig surprisingly deep, though only experts should get into the weeds. The overwhelming majority of users should keep the defaults as they are.



To fire up a quick or custom scan, you must choose Advanced Scan from the three-dot menu for the Scanner on the dashboard.

Scheduled and manual scans

At installation, Malwarebytes Premium Security automatically creates a scheduled scan once per week. It runs whenever your system is idle, which the app calls a "smart scan." You can edit this default or create additional scheduled scans.

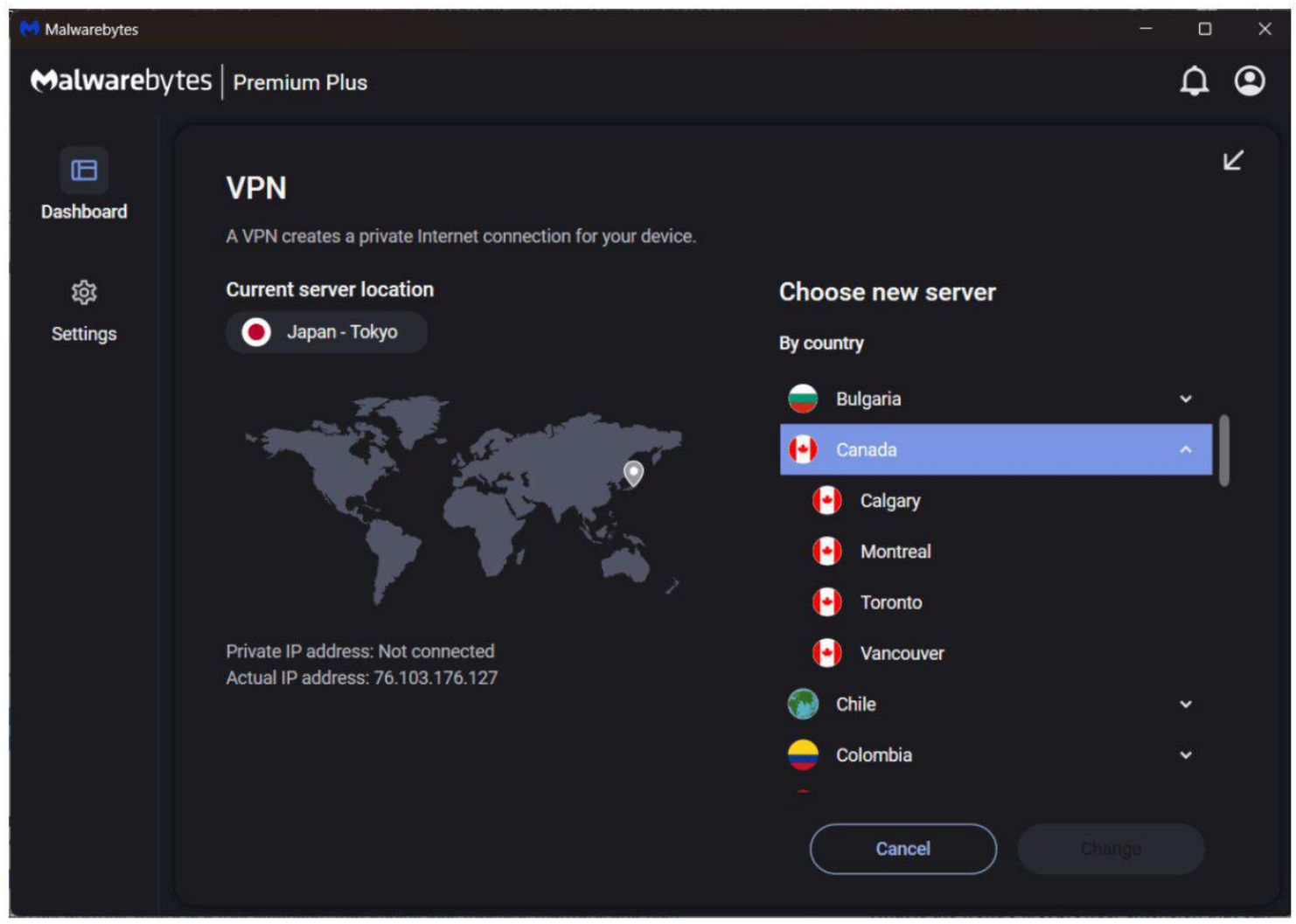
For manual scans, Malwarebytes offers three types. The default is a threat scan, which checks commonly targeted areas of your PC, including things running in memory and at startup, as well as registry changes. Files stored on your PC are also looked over.

To fire up a quick or custom scan, you must choose Advanced Scan from the three-dot menu for the Scanner on the dashboard. Custom scans let you tweak a handful of settings related to file types and areas of your PC, as well as how to handle potentially unwanted programs and modifications to your system.

Additional features

Browser extension

Malwarebytes offers a Browser Guard extension for Chrome, Firefox, and Edge, but despite being available as a separate free download, it's still considered a component of the Premium Security suite. After installation, it runs quietly in the background, protecting your browser from malware



You can choose servers from a wide selection of countries.

and scams (including credit card skimming), as well as serving as an ad blocker.

VPN

Malwarebytes keeps its controls for its VPN simple rather than restrictive. Firing up the service is quick and fast, as is choosing a location for a server—and Malwarebytes lets you choose a handful of cities within countries outside of the US, more similar to a dedicated VPN (fave.co/3FtTTMs).

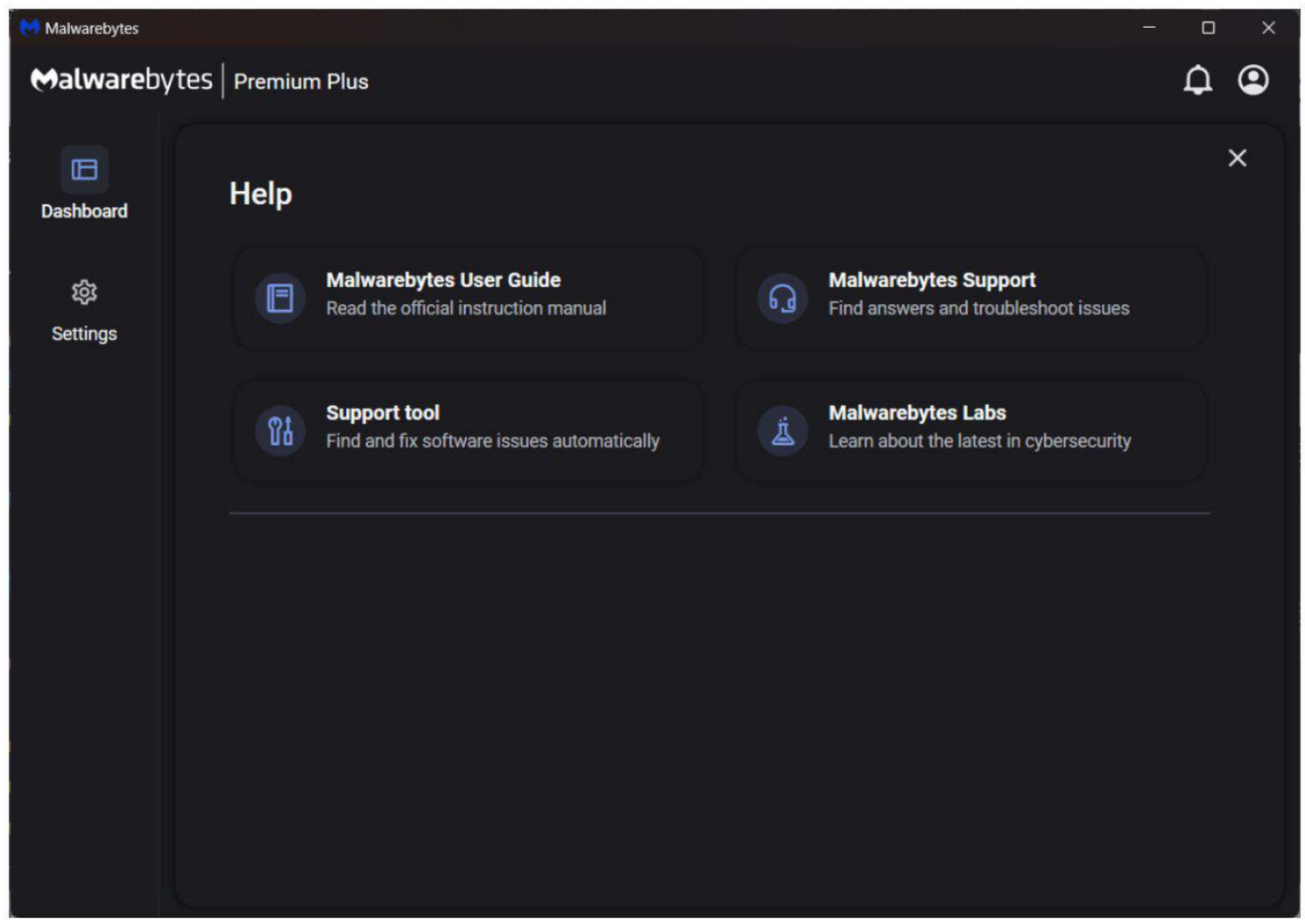
You can choose servers in Albania, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, Colombia, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hong Kong, Hungary, Indonesia, Ireland, Israel, Italy, Japan, Latvia, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, UK, Ukraine, USA.

This country list isn't as large as with some VPN services, but as mentioned above, you can generally choose between two to four cities per country. The exception is the United States, which has 18 cities available, coast to coast.

Speeds held stable when using the VPN during light testing. For U.S. server speeds, Los Angeles (within the same state as PCWorld's San Francisco location) showed a decrease of about 5 to 7 percent, while New York saw a roughly 26 percent drop.

Customer support

From within the app, you can jump to Malwarebytes' user guide, support pages, and support tool. You can also use an AI chatbot for answers to your questions, or, if you're signed into your Malwarebytes account, to contact customer support—you'll get funneled to your choice of email or live chat.



Updates and virus definitions happen automatically in the background, but you can also trigger a check manually.

Updates and maintenance

Updates for the app and virus definitions happen automatically in the background, but you can also trigger a check manually. You'll need to click on the person icon in the upper right of the app window, then choose About Malwarebytes and click on the Check for updates button.

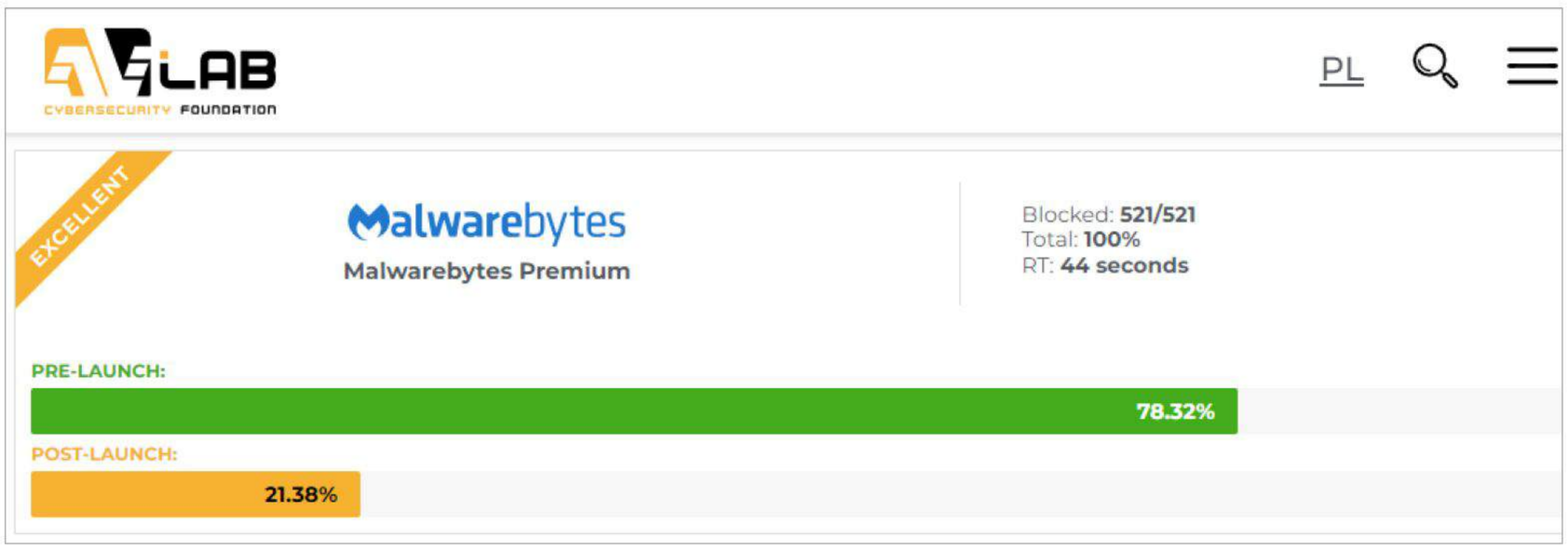
PERFORMANCE

While Malwarebytes participates in some independent benchmarking of its software, it has no current results from AV-Test and AV-Comparatives, two major organizations that test how well antivirus suites can catch threats.

Instead, the company points the curious toward AVLabs' testing data. During the May 2024 advanced in-the-wild test (fave.co/3S8LLtN), Malwarebytes caught all 521 samples—though its detection rate was split between 78.32 percent pre-launch and 21.38 percent post-launch of the samples (that is, before the malware samples could activate versus after). In comparison, rivals Bitdefender (fave.co/4bekQEa) and McAfee (fave.co/3XTuJBe) caught nearly all the samples before they could execute, with 97.98 percent and 99.3 percent pre-launch detection, respectively.

When asked about its participation in independent benchmarks, a representative from Malwarebytes said the company "focuses on third-party testing that is most closely aligned with the needs of customers" and that it works "with the third-party testers that are most relevant to what our customers encounter in today's threat landscape."

During hardware performance tests on our budget Acer Aspire 3 test laptop, Malwarebytes lived up to its claims of light impact on PC resources. When left idle in the



AVLab results for Malwarebytes May 2024.

background, it had virtually no effect on typical tasks, as shown by PCMark 10's extended benchmark. That test simulates video chatting, web browsing, gaming, image and document editing in free apps like GIMP and LibreOffice, and the like.

If you work instead on Microsoft Office documents, our UL Procyon tests showed a minimal impact on results, with a less than 3 percent difference. Similarly, our Handbrake encoding test only dipped by about 4 percent.

Even running a threat scan continuously during our benchmarks didn't disturb these numbers much—PCMark 10 slipped by about 7 percent, Procyon by about 14 percent, and Handbrake by about 19 percent. Given how rival antivirus engines from rivals like McAfee and Norton are far greedier about system resources, Malwarebytes does distinguish itself in this regard.

BOTTOM LINE

If you dislike complicated interfaces, Malwarebytes Premium Security can be a good fit as an alternative to Windows Security—so long as you don't mind not getting as much bang for your buck. The app is attractive and clean in its layout, and the settings are clear and straightforward. However, more-seasoned security vets may have reason to hesitate on pulling the trigger, due to the relatively low amount of independent testing data available about software performance.

Malwarebytes Premium Security

★★★½☆

PROS

- Clean, simple interface.
- Essential protection against malware.
- Lower impact on PC system resources.

CONS

- Less participation in testing performed by independent security organizations.
- Extremely light on features.

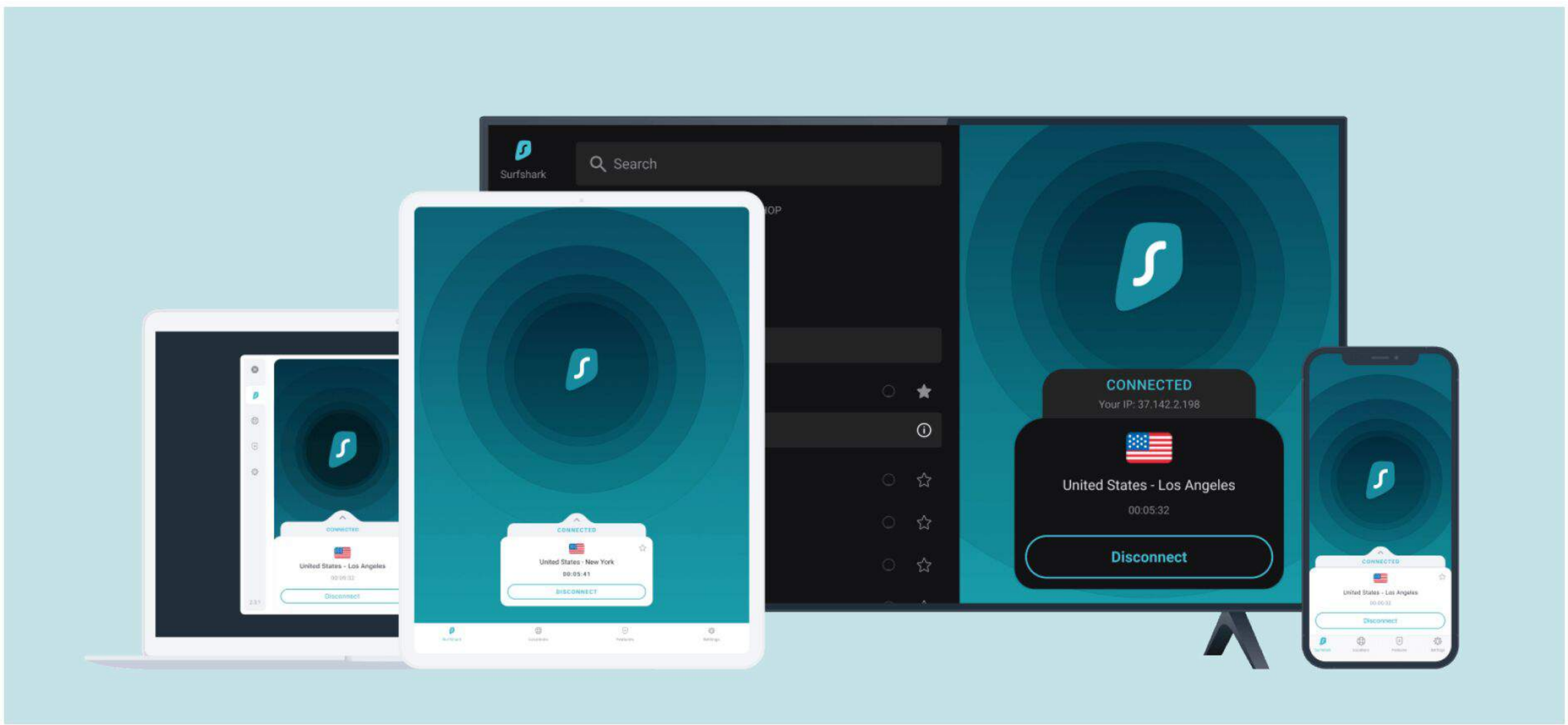
BOTTOM LINE

Malwarebytes Premium Security offers a simple, easy-to-use alternative to Windows Security—but don't expect big bang for your buck. Seasoned security vets may also find the lower amount of available independent performance test results offputting.

From $60 per year

Surfshark: A versatile VPN service packed with extras

Good privacy, no device limits, and tons of extras—I'm sold. **BY SAM SINGLETON**



Surfshark continues the trend of other mega-VPN services as a one-stop shop for all things related to personal online privacy and security. The company offers a top-tier VPN product that continues to expand and improve with each new iteration. And since its merger with NordVPN under the parent company Cyberspace, Surfshark is now developing cutting-edge personal security features via its Nexus technology.

This all sounds great, but are all of these features really worth it in a VPN service? I took a deep dive with Surfshark to find out.

SURFSHARK IN BRIEF

P2P allowed: Yes

Simultaneous device connections: Unlimited

Business location: The Netherlands

Number of servers: 3,200-plus

Number of country locations: 100

Cost: $15.45 per month, $41.85 for one year, or $59.13 for two years

FEATURES AND SERVICES

When you initially open Surfshark, you notice that the interface is clean and simple. On the left rail you have options for VPN, Alternative ID, Alert, Antivirus, Search, and

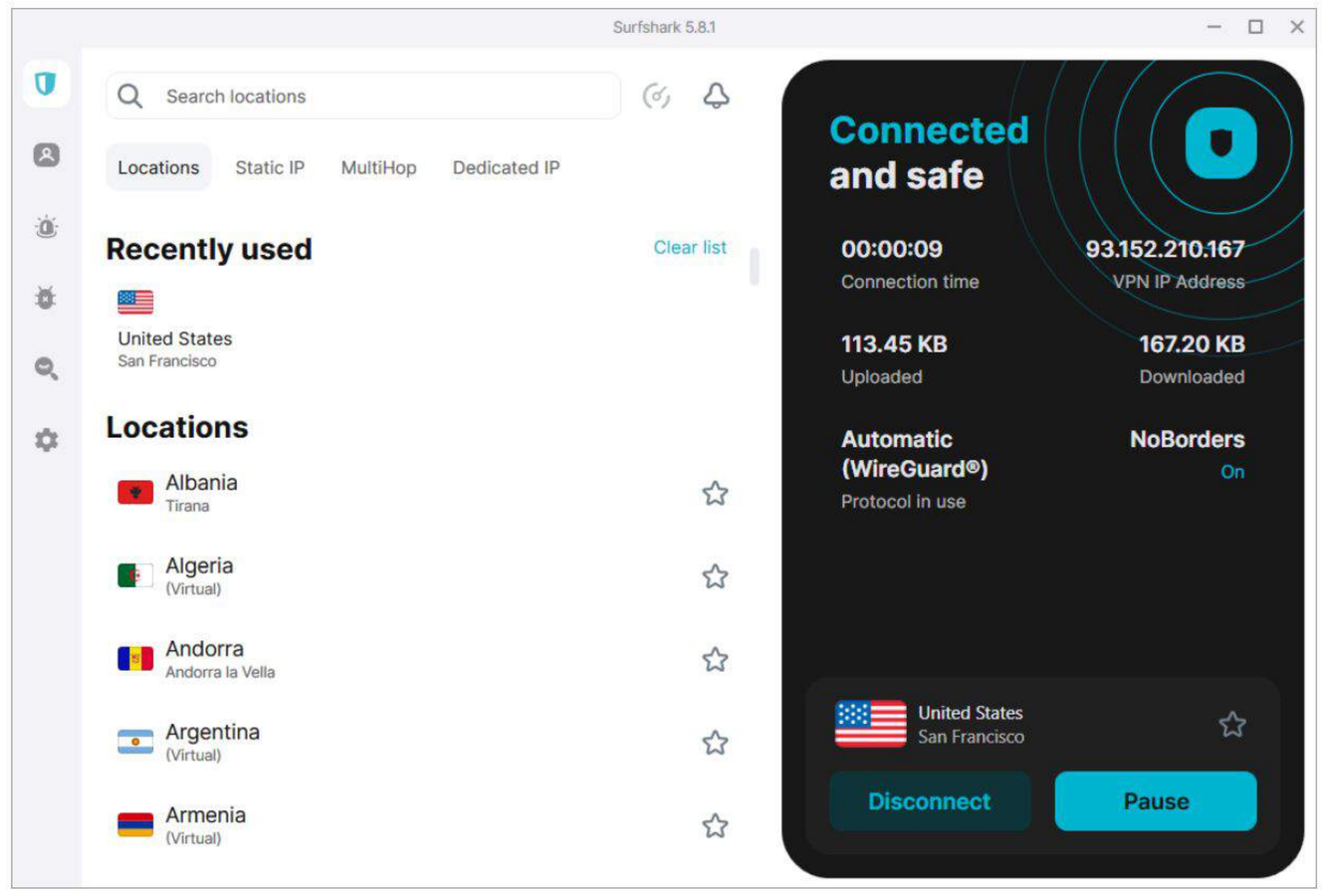
IMAGE: SURFSHARK

Settings. Then in the middle there is a list of all server locations listed alphabetically by country. On the right side there is a button to connect to the chosen server. It might not be as sleek and futuristic as some VPN interfaces, but the minimalist approach makes it easy to navigate and use.

Surfshark prides itself on the number of servers it provides, which is well over 3,200 across 100 different country locations. There are admittedly a lot of countries that only have one server to connect to, but more popular locations such as the U.S., Canada, and Australia offer multiple server locations spread throughout.

My only real gripe with Surfshark's server network is that a large number of them are virtual servers, which aren't physically located in the countries they claim to be in. This can sometimes lead to privacy risks if your data is routed through a country with invasive privacy laws, or a potential for slower speeds if the virtual server is overloading the physical server it's borrowing resources from. Surfshark does a commendable job of pointing out which servers are physical and which are virtual, though.

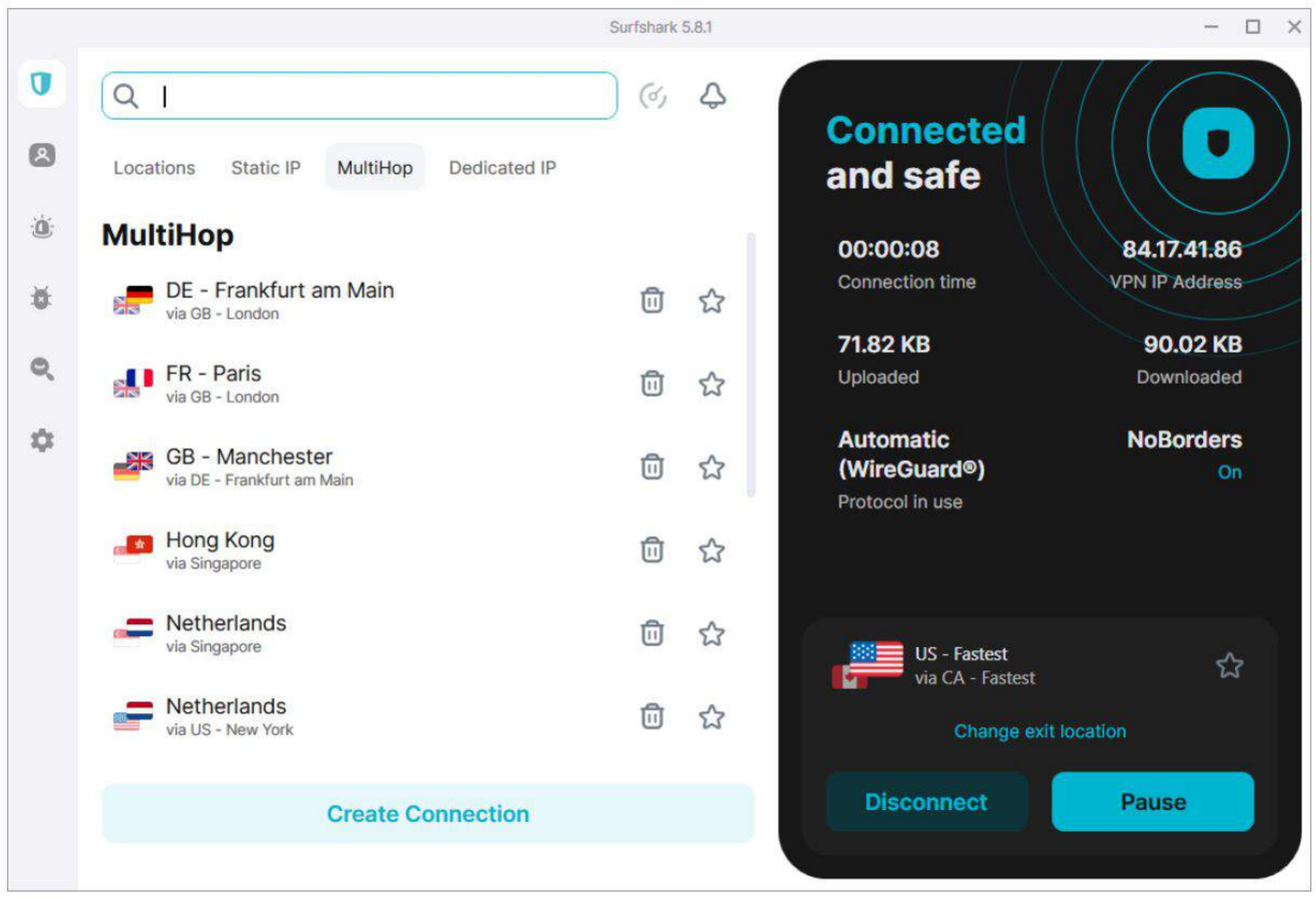
In addition to offering a good server spread, Surfshark allows unlimited



Surfshark's home screen might not be the most exciting, but it's easy to navigate.

simultaneous device connections. This is a big draw since the majority of VPN providers only offer a modest five or six simultaneous connections.

On the main screen above the servers you can connect to, you're able to choose between four options: Locations, StaticIP, MultiHop, and the newly added Dedicated IP. Locations is a list of all the available country servers you can connect to. StaticIP allows you to connect to shared servers with IP addresses that never change. MultiHop allows you to further obfuscate your actual location by routing your traffic through more than one external server. Recently Surfshark also added the option, for an additional fee, to get a Dedicated IP address, which is a unique IP address that never changes and that only you can use.

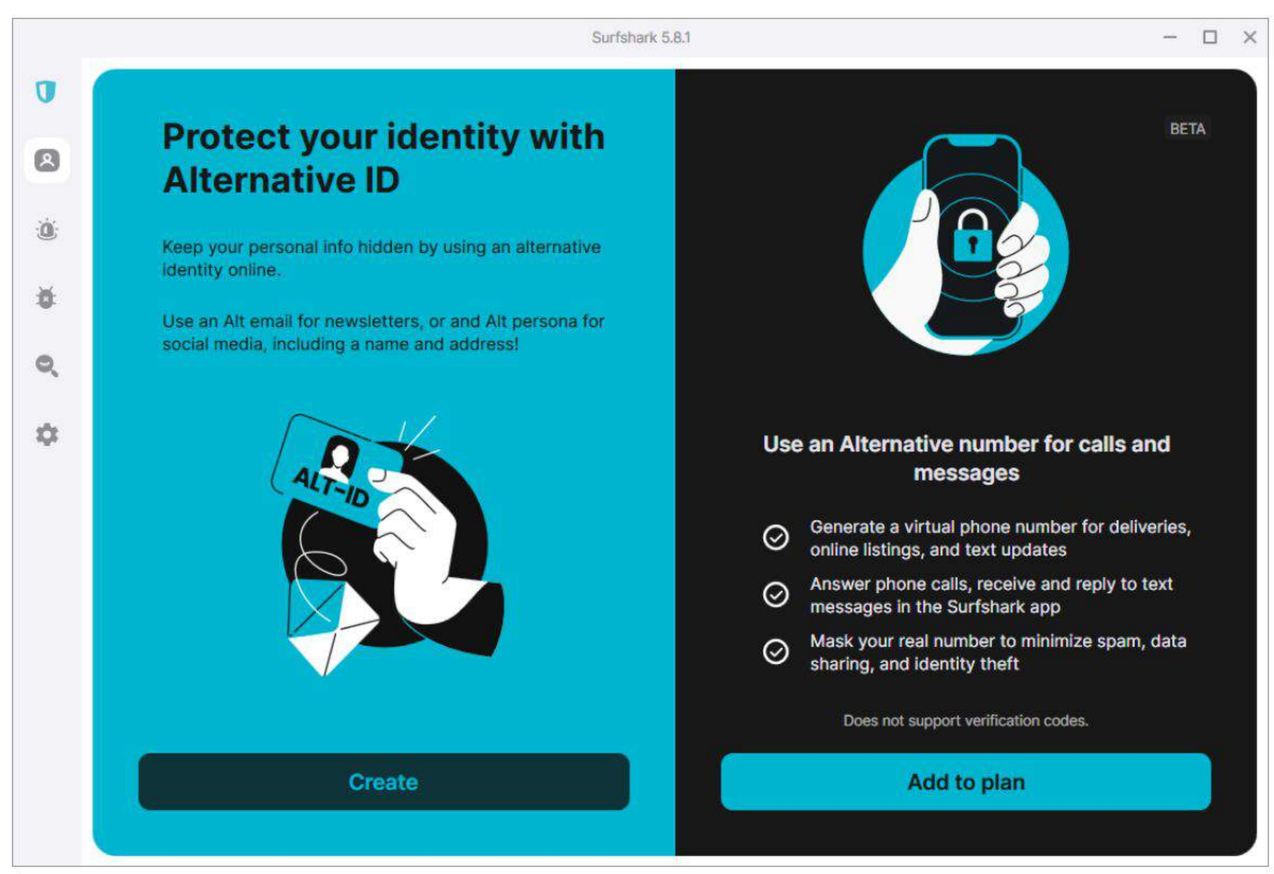


Surfshark has one of the best multi-hop features I've ever seen.

I was thoroughly impressed with Surfshark's multi-hop feature. While many VPN services now offer multi-hop connections, Surfshark stands out by allowing the user to not only choose a predetermined route, but also create their own multi-hop route. This is a nifty feature that gives power users and those concerned about privacy more autonomy in securing their connections.

Surfshark also provides an ad, tracker, and malware blocker called CleanWeb—though it's not turned on by default. It also offers a split-tunneling feature, which it calls Bypasser. This feature allows you the option to route apps and websites through the VPN or keep one or the other connected separately. This is a good option for those who wish to keep their web browsing secure via a VPN while keeping online games outside the VPN connection in order to minimize potential latency issues.

Additionally, Surfshark provides a kill-switch function that will automatically disable your internet connection should your VPN connection drop for whatever reason. There is also a feature called NoBorders, enabled by default, which is its own version of obfuscated servers. This feature allows users in countries that generally restrict VPN connections to maintain access to Surfshark.

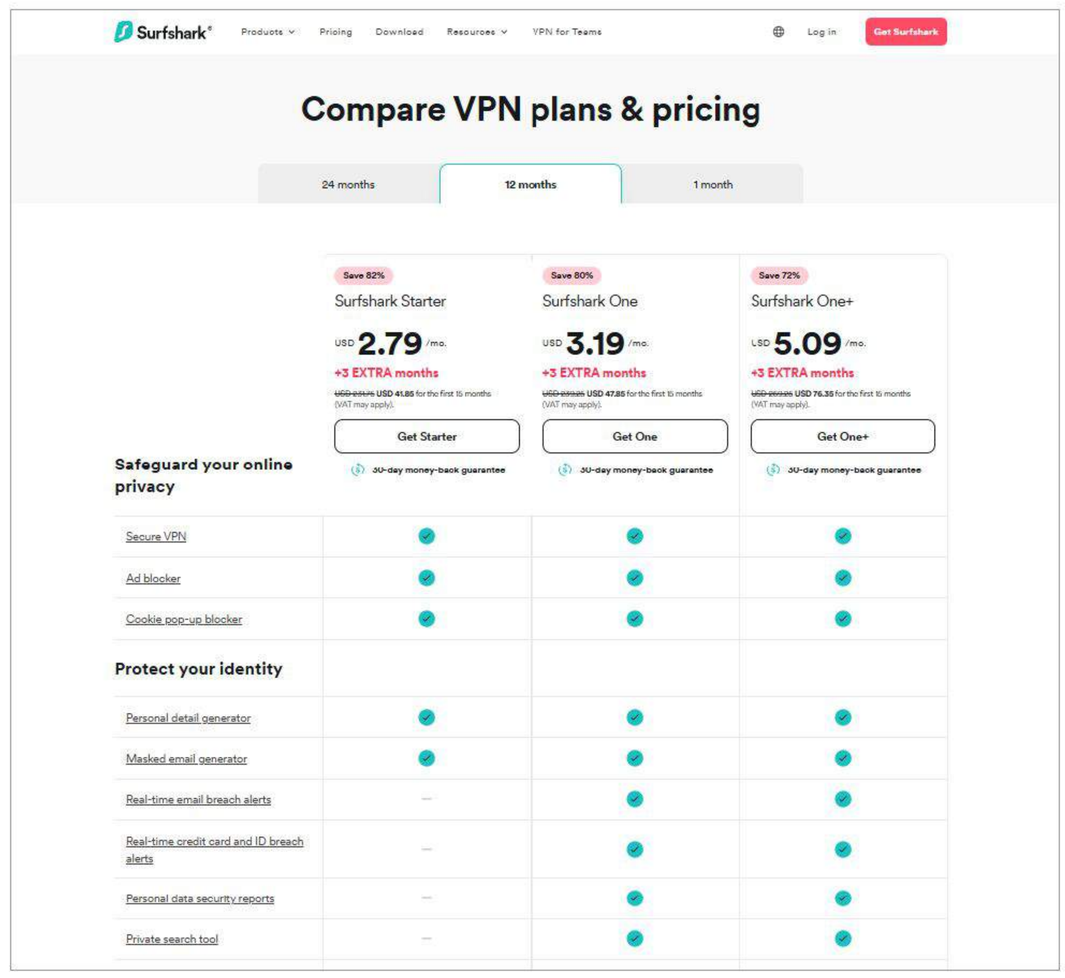


Surfshark's latest Alternative ID feature can help keep you safe from annoying spam and data sharing.

Included with the Surfshark One and Surfshark One+ plans, you'll also receive Surfshark Alert for real-time identity and data breach monitoring as well as access to its standalone antivirus. Included with all plans is Surfshark's latest offering called Alternative ID, which allows users to create an alternative email or phone number in order to mask their real contact information from spam and data sharing services.

Suffice it to say, Surfshark provides a ton of features. I spent a good chunk of time just setting everything up before I even connected to the VPN. It may seem a bit overwhelming, but Surfshark does a good job of holding your hand through most of it and providing clear and concise explanations for newbies.

Surfshark is also working hard to bring new and innovative ideas to the VPN scene. In 2023 it rolled out Nexus Technology. Nexus is a single network made up of Surfshark VPN servers. There are huge potential security and privacy boosts from this including rotating your IP address without disconnecting your active VPN connection, further obfuscating your browsing activity. Nexus also uses a Dynamic MultiHop feature to connect you to the fastest available entry server and exit through any desired location, presumably increasing connection speeds across the board.



Surfshark's monthly pricing is expensive, but opting for a long-term plan makes things a lot cheaper.

PRICE

Surfshark comes with three different plans: Surfshark Starter, Surfshark One, and Surfshark One+. Each plan option is available in monthly, one-year, and two-year terms.

Surfshark Starter provides the basic VPN along with an ad- and pop-up blocker, plus access to its Alternative ID feature. The monthly rate is a steep $15.45 per month, dropping down to a much more reasonable $41.85 for the first year, or $59.13 for the first two years. As of the time of writing, that likely places Surfshark as the most expensive monthly plan of any VPN I can recall.

A Surfshark One subscription comes with everything from the Starter pack plus identity

and data breach monitoring, private search tools, and access to its antivirus software. The rate is $15.95 monthly, $47.85 for the first year, or $72.63 for the first two years.

Surfshark's top-tier One+ plan gives you all of the above plus a personal data removal service for $17.95 per month, $76.35 for the first year, or $115.83 for the first two years.

It's worth noting that if you opt for the one- or two-year plans on any bundle, the renewal price after the initial term will typically default to a more expensive yearly plan.

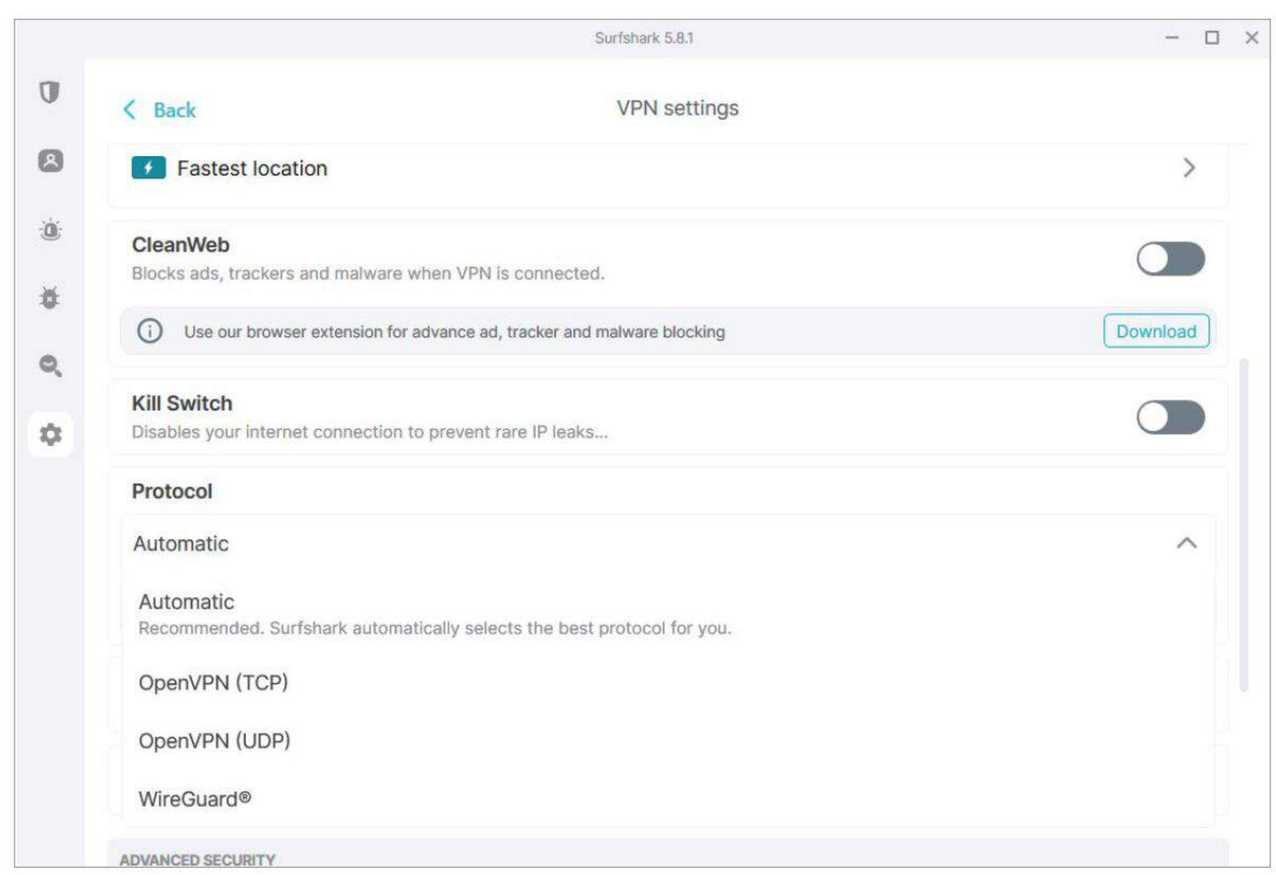
PERFORMANCE

During my testing I rated connection speeds across Surfsharks' servers in six different countries around the world and then compared them to my baseline internet speed. Surfshark server speeds were once again solid, if not particularly outstanding. Similar to the last time I tested the service, speeds averaged just over 61 percent of the base download speed and a slightly more impressive 70 percent of the base upload speed. That isn't the best I've seen, but depending on your own home internet, it should be more than enough to do most things, including streaming HD video without any issues.

For those looking to use the service to bypass location restrictions on streaming websites, my testing showed that Surfshark was overwhelmingly successful. Across every server tested and for all major streaming services, the VPN was able to bypass geo restrictions. This included sites such as Netflix, Amazon Prime, HBO Max, Hulu, and Disney Plus. This excellent result puts Surfshark among the very best VPNs for streaming Netflix (fave.co/3KHEZaF), right along with NordVPN (fave.co/3wX9BwC) and ExpressVPN (fave.co/3nthVRR).

SECURITY AND PRIVACY

Surfshark states that it doesn't collect any of your online activity, including browsing history, session information, bandwidth used, connection time stamps, network traffic, or IP addresses. This no-logs policy claim was verified to be true by the



All of the best protocols, including OpenVPN and WireGuard, are available with Surfshark.

company Deloitte during an independent audit of Surfshark most recently in January of 2024. This is exactly the type of reassurance users should expect from a top VPN company, and it goes to show that Surfshark is serious about its customers' privacy.

The service also keeps privacy in mind during setup. When signing up for a Surfshark subscription you only need to supply an email address and the company accepts payments via credit cards, PayPal, Google Pay, and various cryptocurrencies.

One thing to note, though, is that Surfshark has moved its headquarters from the British Virgin Islands to the Netherlands in recent years. This probably isn't an issue as the Netherlands' data retention laws are generally privacy-friendly. However, the Netherlands is still subject to Fourteen Eyes jurisdiction, which means that the government could potentially require Surfshark to share certain information about customers.

Thankfully, as the latest no-logs audit proves, this shouldn't be a major concern as Surfshark doesn't log or keep any user data anyway—no records means nothing to share.

In regard to security, Surfshark uses standard AES 256-bit encryption. It also offers options for several VPN protocols including OpenVPN, WireGuard, IKEv2—depending on your operating system.

BOTTOM LINE

Surfshark offers unlimited device connections, good speeds, full compatibility with major streaming services, and an impressive number of extra features. The Windows app is well designed and easy enough to understand. It also has some nice extras such as ad, tracker, and malware blocking, as well as split tunneling and multi-hop.

With all of these great features, Surfshark is a solid all-around VPN service. The monthly price is enough to make you choke, but if you opt for the two-year contract you'll get all of this for a bargain price. Overall, whether it's getting around region blocks or just enjoying a more private and secure browsing experience, Surfshark remains one of my favorites.

Surfshark

PROS

- Unlimited simultaneous device connections.
- Works well with Netflix.
- Good catalog of extra features.
- Low price on long-term plans.

CONS

- Expensive monthly plan.
- Large portion of global servers are virtual.

BOTTOM LINE

Surfshark continues to be a top VPN, offering better-than-average speeds, unlimited connections, good privacy promises, and a great server spread. It also offers some convenient extra security features. Monthly plan prices might be steep, but long-term plans are very affordable.

From $15 per month

YAWN. WINDOW FEATURES FEEL L DEMOS

AT LAUNCH—AND WITHOUT RE HERE TO GET THE BLOOD PUM

WS' COPILOT+ AI

LIKE EARLY TECH AT BEST

ECALL—THERE'S JUST NOT MUCH MPING. **BY CHRIS HOFFMAN**

IMAGE:MICROSOFT

Microsoft, Qualcomm, and their PC-manufacturing partners are seriously hyping Copilot+ PCs (fave.co/3za4DSf). They'd have you believe that these "next-generation AI laptops" are packed with AI smarts and useful features.

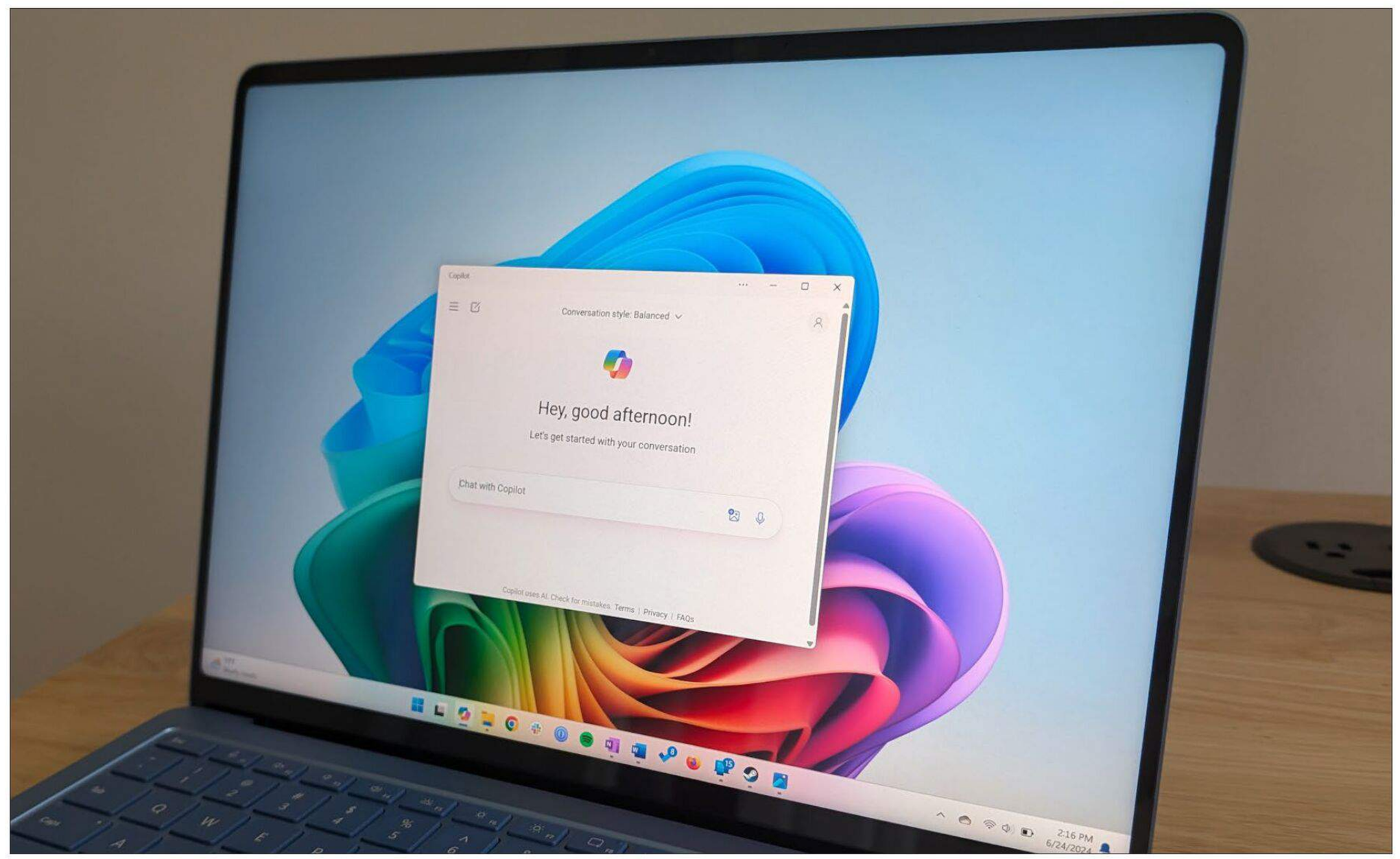
But while the *hardware* for AI tasks is ready in these laptops, the actual *features* built into Windows aren't making full use of it.

We're in a weird position. We're excited about these laptops because they're the first seriously impressive Windows-on-Arm laptops. We're excited about long battery life with snappy performance. And we're excited that next-generation Intel Lunar Lake hardware (fave.co/4f6zIH1) is looking like a huge leap for traditional x86 laptops.

But we're *not* excited about all these at-launch AI features being pushed by marketing campaigns. Snapdragon X Elite–powered PCs (fave.co/40topBX) might be intriguing, but if you're excited about an immediate AI upgrade to your Windows experience, you're going to be disappointed. Here's why.

COPILOT+ PC? MORE LIKE COPILOT– PC

The name Copilot+ PC conjures to mind a kind of PC with extra features relating to Microsoft's Copilot AI chatbot. After all,



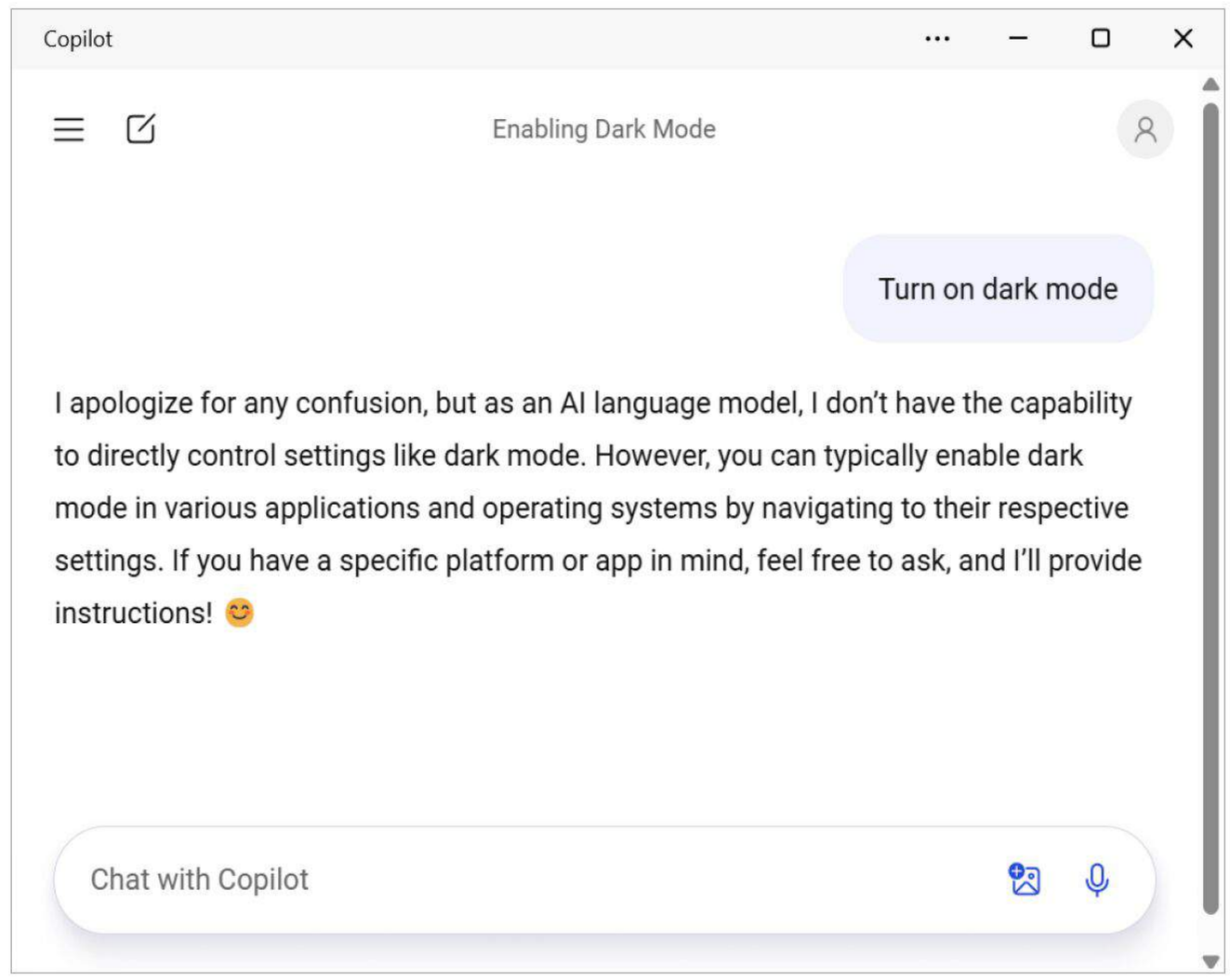
If you're excited about an immediate AI upgrade to your Windows experience, you'll be disappointed.

Copilot Pro (fave.co/4cYhJRm) is a paid subscription that upgrades the Copilot chatbot experience.

That's not the case at all. A Copilot+ PC offers no extra Copilot upgrades. You get a Copilot key on the keyboard, which first-generation AI laptops with Intel Meteor Lake hardware (fave.co/3PUqbHI) have been offering for many months now. That's it. Copilot doesn't run offline or use the new integrated neural processing unit (NPU) hardware (fave.co/3VJ0eyD) to do anything at all.

In fact, the situation is much more dire than that. These machines ship with a new Copilot app experience—it's no longer a sidebar, but rather a normal floating desktop window. That's fine. But, as Tom Warren noted for *The Verge*, the new Copilot app experience is a step back (fave.co/4cDb3s7). You can't tell it to "turn on Dark Mode" or "empty the Recycle Bin" anymore.

Microsoft may eventually improve the Windows integration in this new Copilot app. And, even if not, this new Copilot experience will eventually come to all Windows 11 PCs. But, at launch, Copilot is surprisingly *less powerful* on a Copilot+ PC than it is on a standard Windows 11 PC.



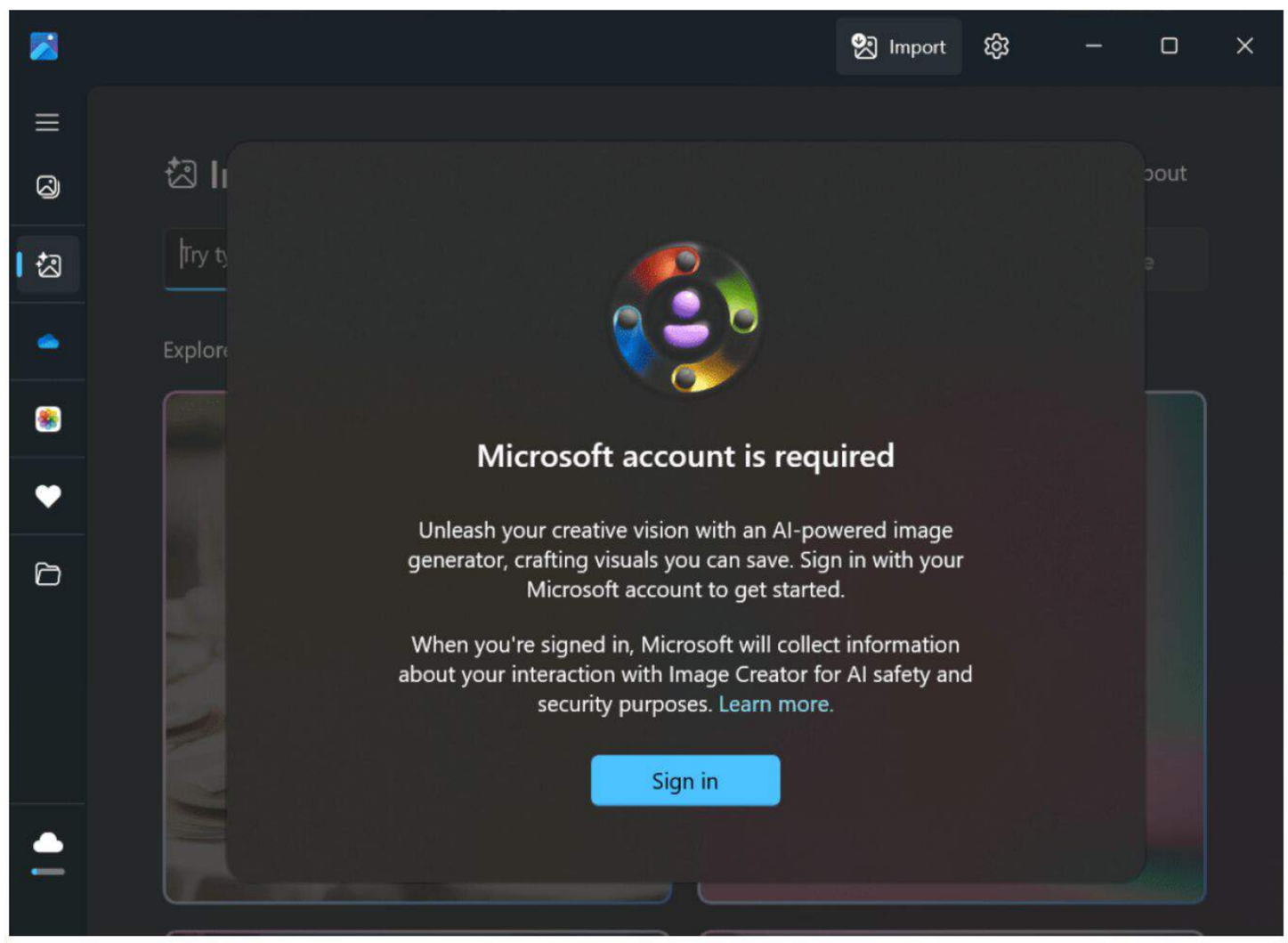
You can no longer tell Copilot to "turn on Dark Mode."

It also doesn't have those fancy GPT-4o features Microsoft showed off, where it can see your screen and talk you through, say, Minecraft gameplay. Those features will arrive in the future—but when they do, they won't need Copilot+ PC hardware. That impressive demo will work on all Windows 11 PCs.

AI IMAGE GENERATION NEEDS A MICROSOFT ACCOUNT AND INTERNET CONNECTION

A Copilot+ PC has some extra AI image generation tools integrated into various apps throughout Windows:

- Paint has a Cocreator tool that can generate an image as you draw, modifying it to fit your drawing.



You'll need a Microsoft account to use the AI image generation tools.

- Photos has a Restyle tool that will let you use generative AI as a "filter" for your image—for example, taking a photo and making it look like it was a watercolor painting.
- Photos also has an Image Generator feature that generates images to match your text prompts.

Here's the thing: While these tools all use the NPU inside a Copilot+ PC, none of them work offline. They require a Microsoft account and an active internet connection to work. Why? To check your images for "AI safety" before showing them to you.

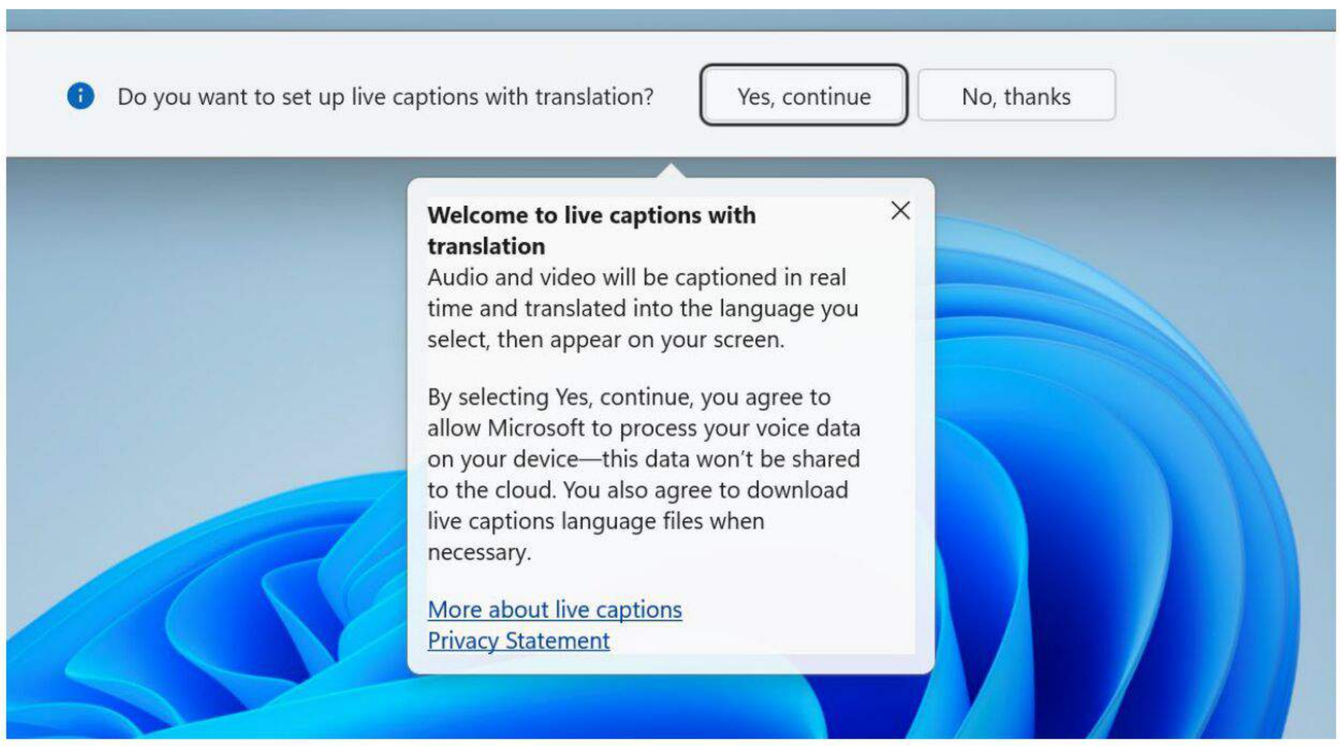
Without getting into whether that's necessary, one thing is clear: There's no point to running these tools on your computer's hardware if they also require a cloud service to function. You might as well use a cloud-based AI image generation tool (fave.co/40aXZTV) that's running in a powerful data center somewhere. You'll get better, more realistic results.

The introduction of these new tools has muddied the AI experience on Windows 11. All of the above tools sit alongside *other* AI image generation tools that do use Microsoft's cloud servers. For example, the Image Creator in Microsoft Paint uses the cloud, while the Image Creator in Photos uses your PC's local hardware.

On a Copilot+ PC, Windows contains a confusing mishmash of AI features that may or may not use the PC's hardware and may or may not use Microsoft's cloud services.

LIVE CAPTIONS GAINS SOME TRICKS, BUT ALREADY RUNS ON ALL WINDOWS 11 PCS

On any Windows 11 PC, you can open the Live Captions app from your Start menu to get AI-powered captions for speech. It uses Microsoft's cloud servers to generate live captions in real time from any audio—audio in



Live Captions can now work offline.

a video file, audio in an online meeting, or even audio being picked up by your PC's microphone.

On a Copilot+ PC, Live Captions gets a little more powerful: It can now work entirely offline (unlike Microsoft's AI image generation tools), and it can now translate speech from 44 different languages to English.

That's a nice upgrade that some people will find very valuable. But if you don't already use Live Captions, or if you do and you wish you had real-time translation or offline support, would that be enough reason to warrant buying a new Copilot+ PC? Likely not.

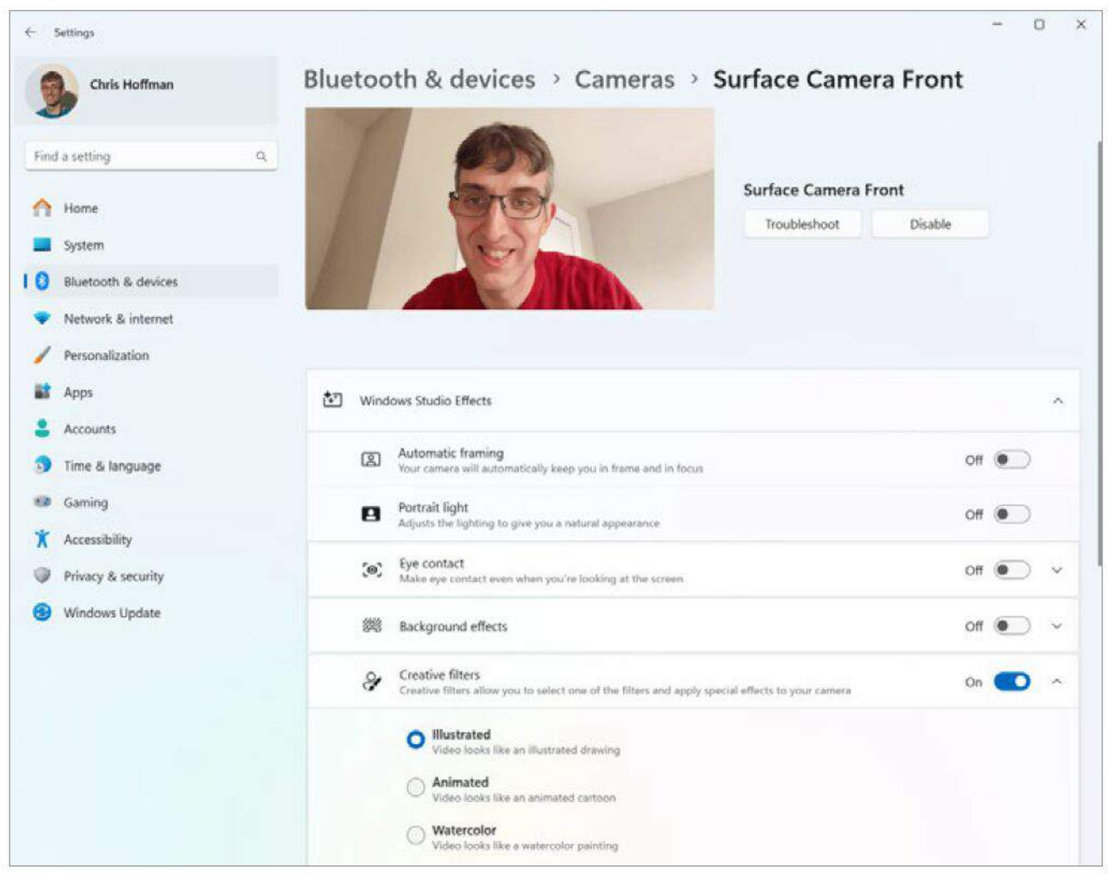
WINDOWS STUDIO EFFECTS ARE FINE, BUT NOT MUCH IS NEW

Microsoft has been talking up Windows Studio Effects as one of the big AI features for Copilot+ PCs. These are real-time webcam effects that use the computer's NPU to change how your webcam looks in any app.

I like them, really. You can enable fake eye contact or blur your background in any app, for example. And, because it uses the NPU, it's a power-efficient way to do webcam effects. You won't be wasting CPU or GPU power in an online meeting.

However, this isn't exactly new. Windows Studio Effects is the one AI feature that functioned out of the box on first-generation AI laptops with Intel Meteor Lake hardware (fave.co/48WBSER). You don't need a Copilot+ PC for them.

There are some extra effects: you can use effects like Animated, Illustrated, and



Windows Studio Effects illustrated effect example.

Watercolor to change how you look on your webcam in real time. It's a nice idea, but I find the effects to be very subtle.

Do I really look "illustrated" in the screenshot above? A little bit! Is that worth buying a Copilot+ PC for? Well, I don't know about that…

RECALL WOULD HAVE BEEN THE BIG FEATURE

Recall will take screenshots of your PC's display every five seconds, create a big database of your PC activity, and then let you search through it with plain language queries—much like when you talk to an AI chatbot.

Unlike the Copilot AI chatbot or AI image generation features, it will work entirely offline. That's what Microsoft said when it announced Recall.

It's clear why Microsoft made such a big deal about Windows Recall (fave.co/4bVAAwo) when it announced Copilot+ PCs. Without Recall, there's a distinct lack of a centerpiece AI feature that really sells these PCs. Instead, it's just a collection of little tech demos that shows off what the NPU can do.

But when Microsoft faced serious blowback regarding privacy and security concerns over Recall (fave.co/4d1eVDb), it decided to pull Recall before launch (fave.co/4eXeCLf) and spend a few more months working on it before release.

Ultimately, this means none of the included AI software featured in Copilot+ PCs at launch is particularly exciting.

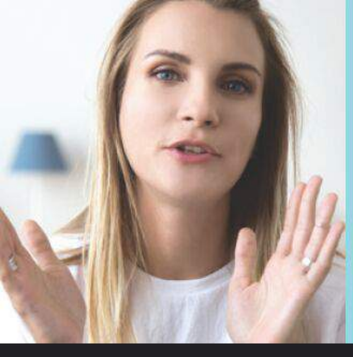
WITH COPILOT+, YOU'RE BUYING INTO A PROMISE

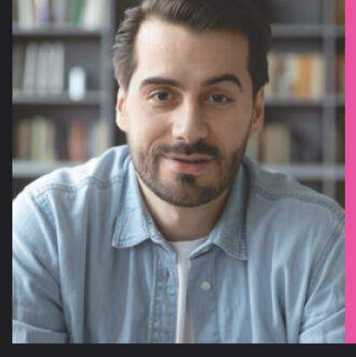
I'm calling these features "tech demos" for a reason. They feel like they exist to demonstrate the power of the neural processing unit and the Windows Copilot Runtime Microsoft is offering developers. The vision of a Copilot+ PC isn't that Windows will totally transform itself. The vision is that third-party developers will leverage this hardware to add AI features to their own applications.

It's early days, for sure. If you're excited about a Copilot+ PC because of the AI features, I recommend you slow down before buying one because you may be disappointed, especially without Recall.

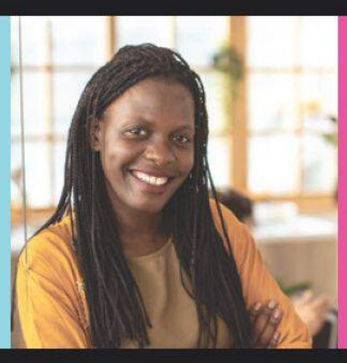
I always recommend buying hardware for what it can do *today*, not based on what it *might* do in the future. (Already this year, buyers of first-generation AI PCs got burned for buying into a vision too early; fave.co/463QD9g.)

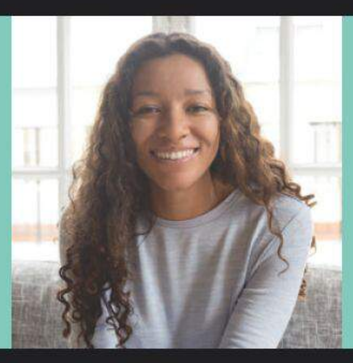
But if you're mainly excited about the battery life and performance promises of Copilot+ PCs, that may be a good reason to buy one. I've been very impressed with the battery life and snappy performance so far. I wish Microsoft and Qualcomm were talking more about that than AI with these debut Snapdragon X Elite laptops.





DROP THE F*BOMB





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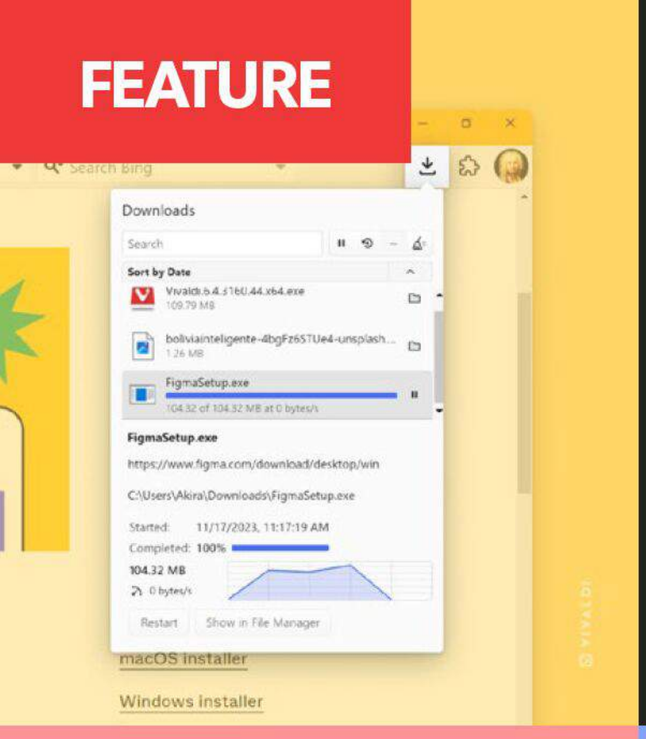
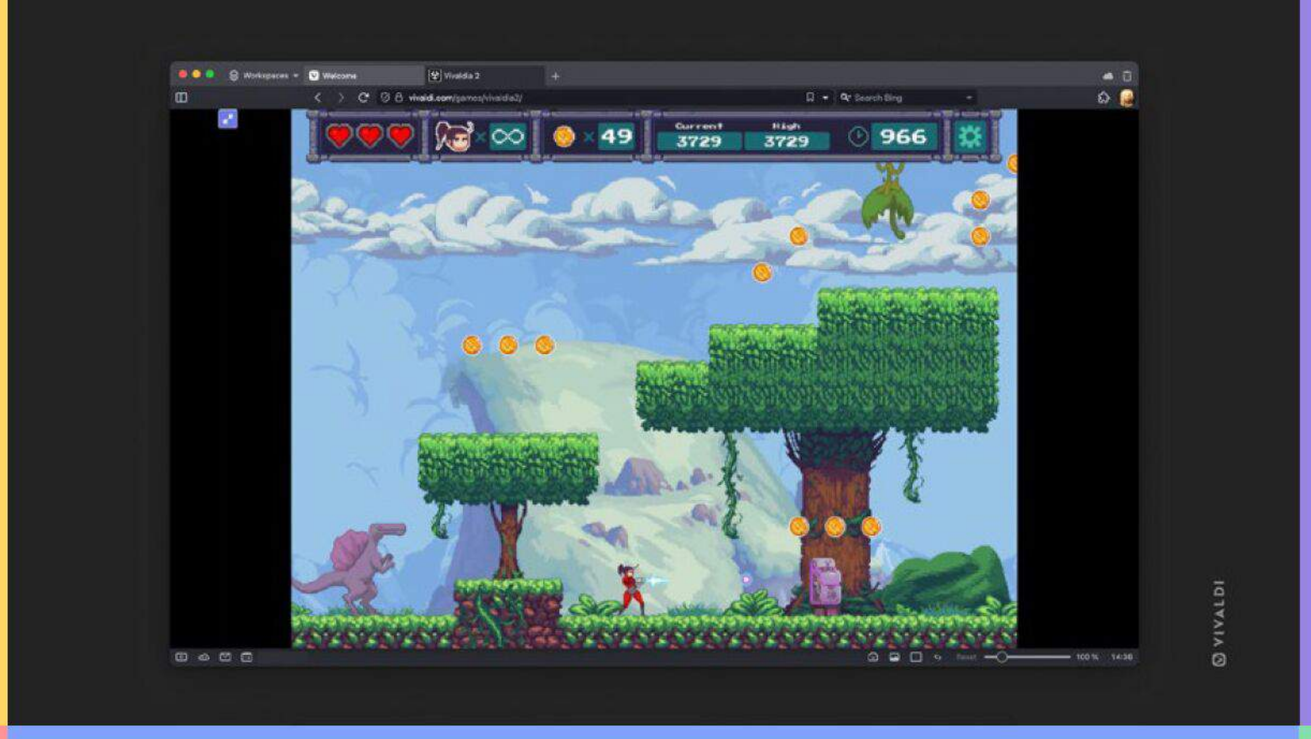
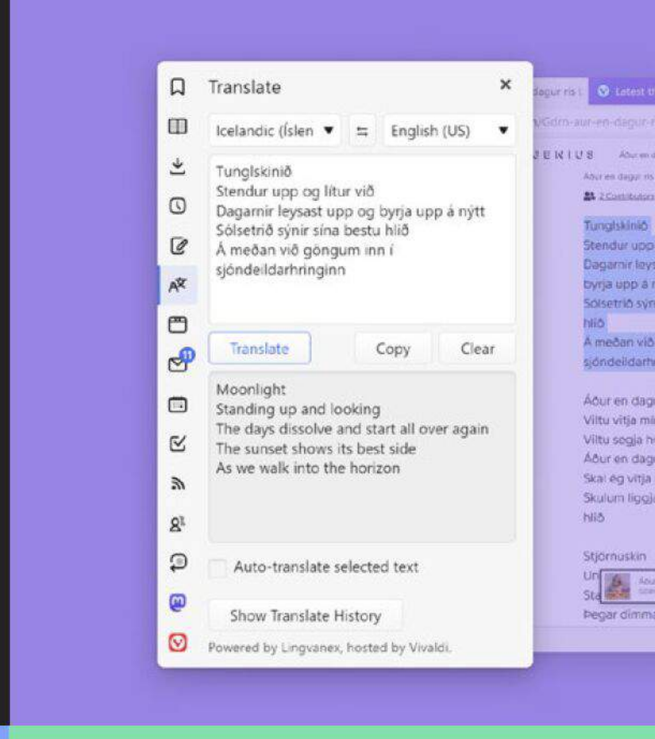
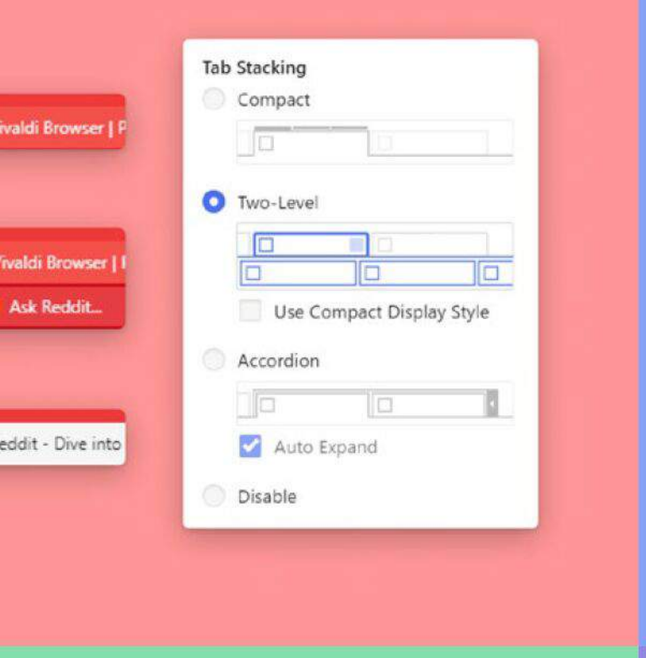
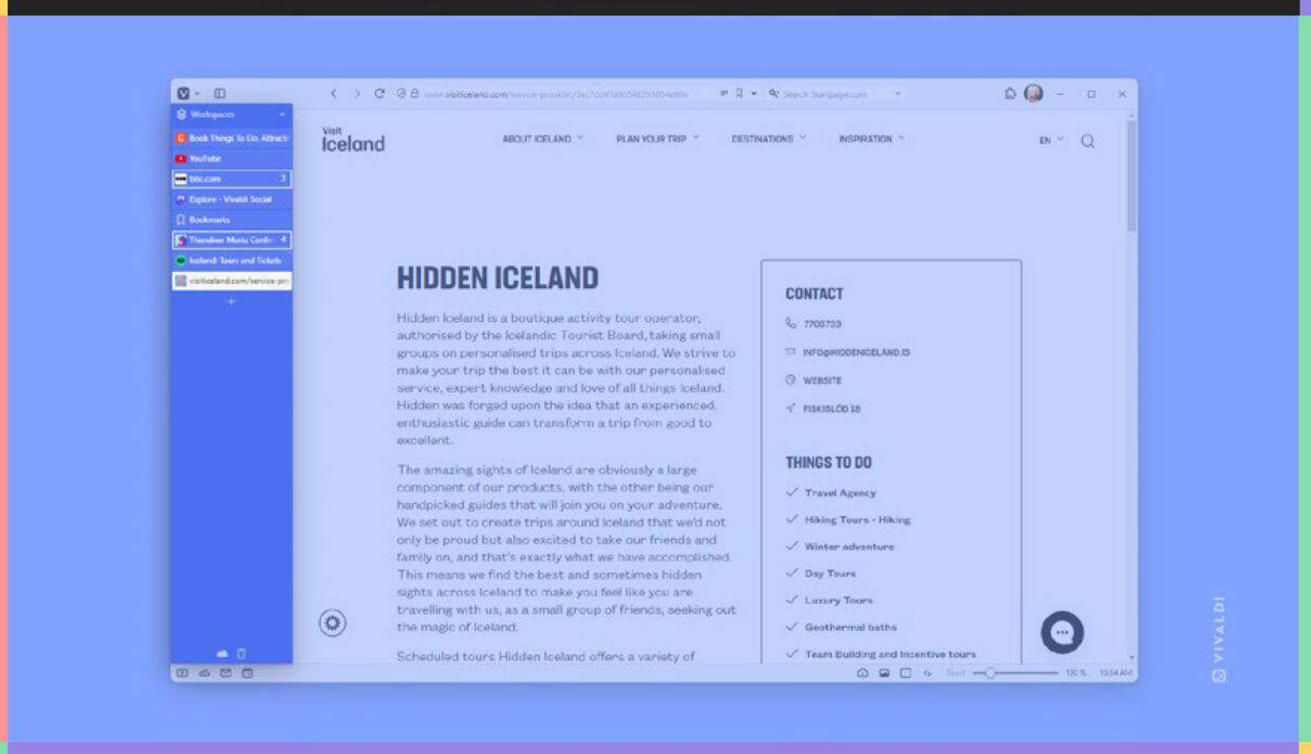
FEATURE

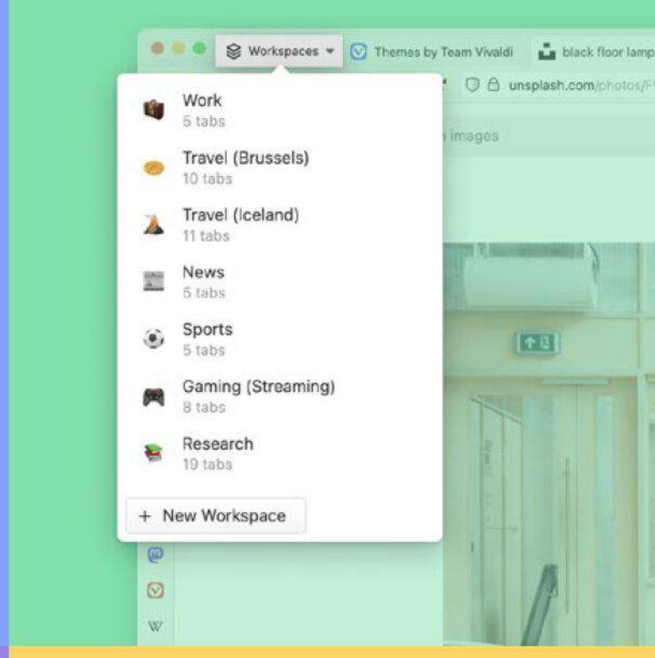


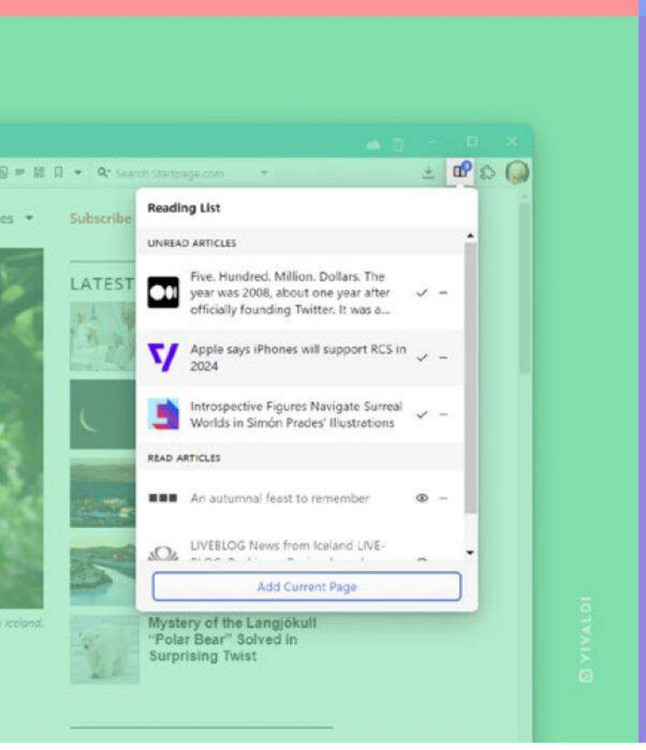


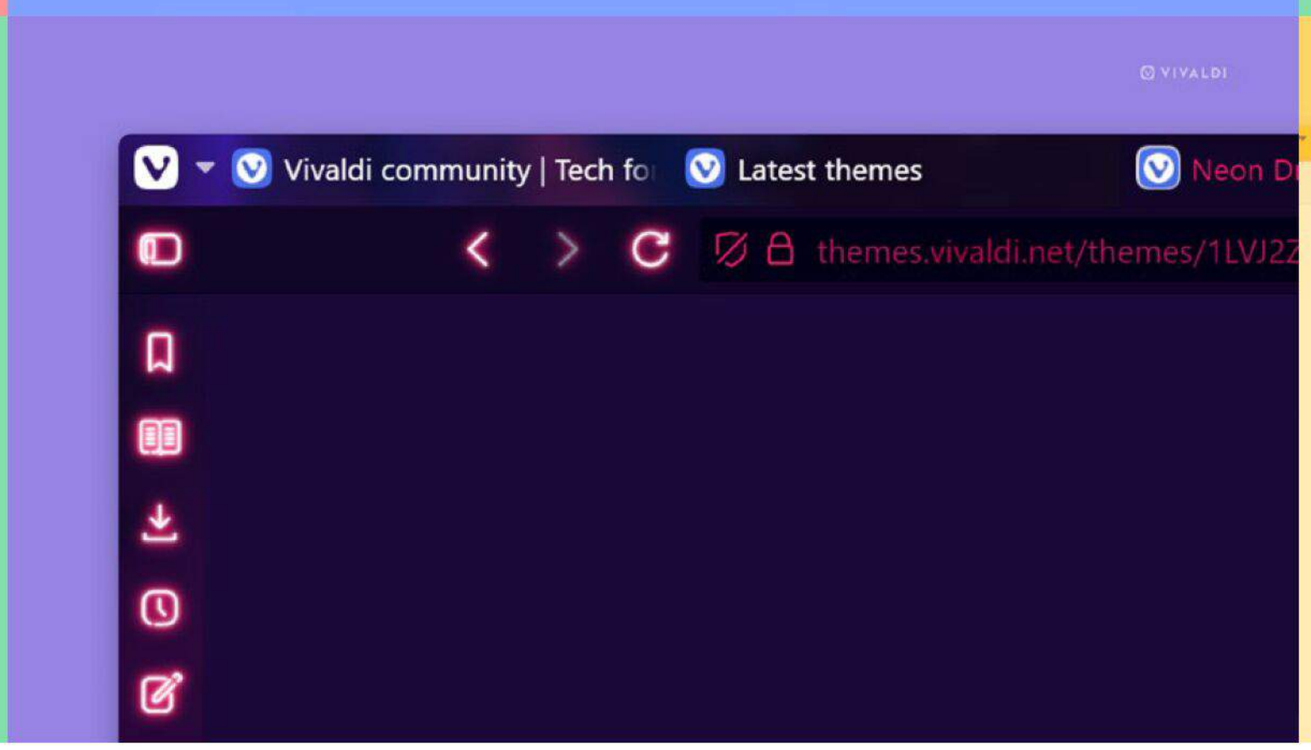


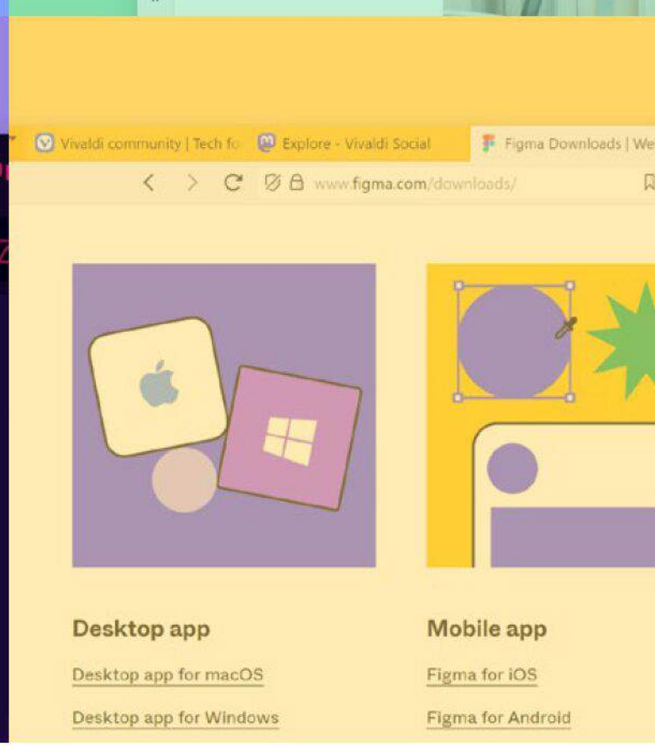




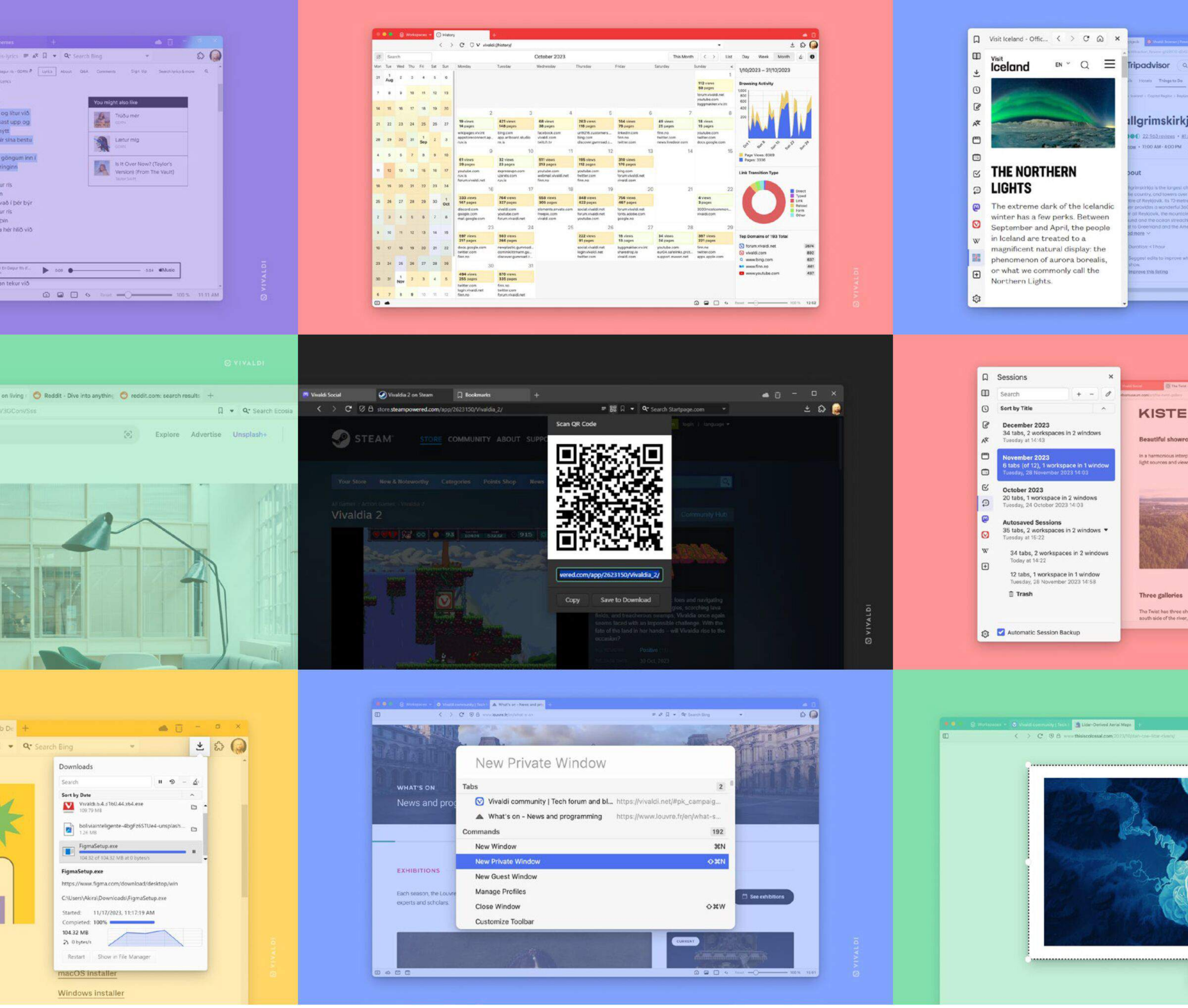








I GOT SICK OF CHR AND SWITCHED TO HERE'S WHAT HAPP



ROME'S BS
TO **VIVALDI**. PENED

AFTER MORE THAN A DECADE, I'VE BROKEN MY GOOGLE BROWSER HABIT ON WINDOWS AND MOBILE.

BY MICHAEL CRIDER

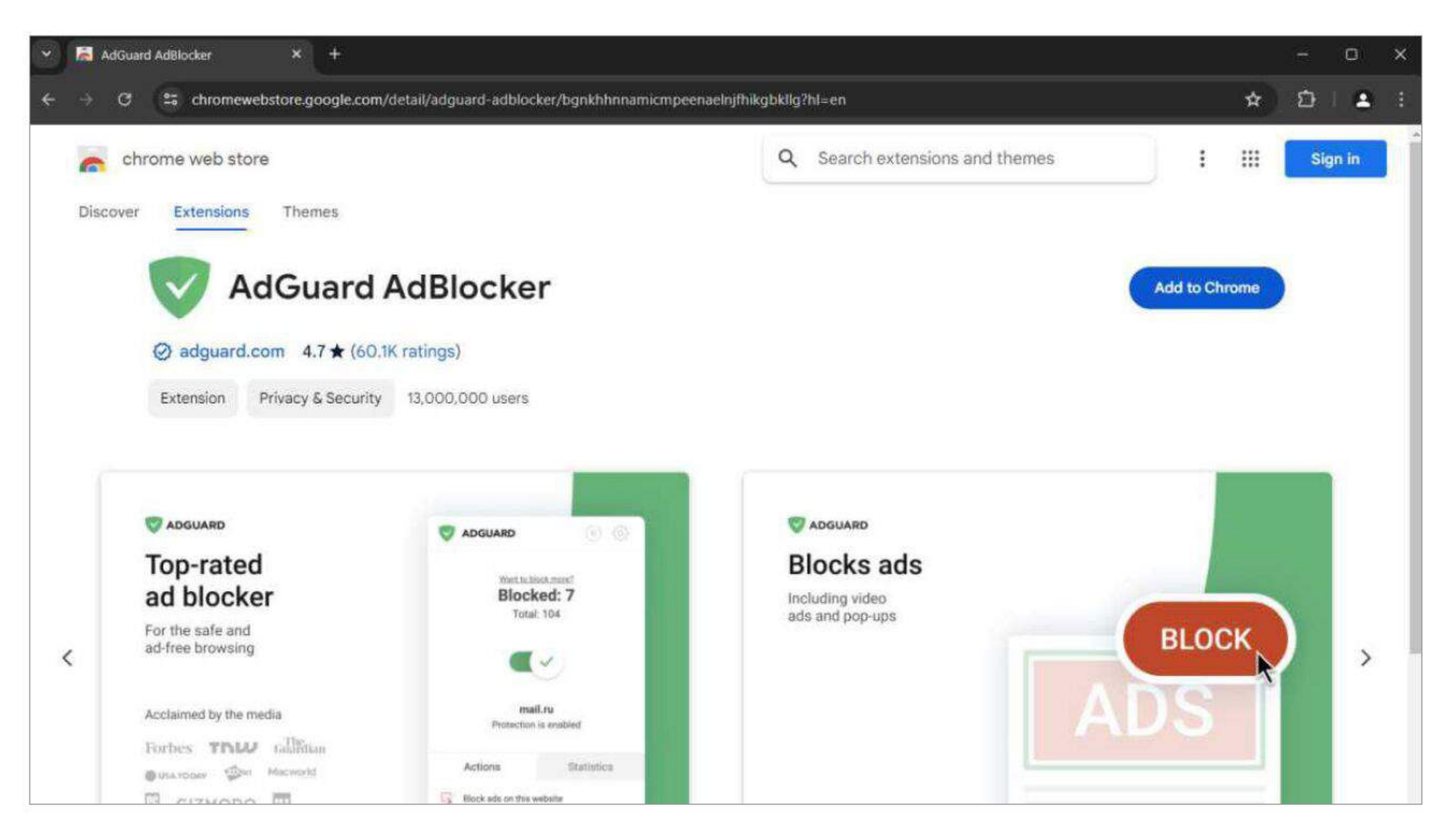
I honestly can't remember exactly when I switched from Firefox to Chrome. I definitely let Google's "new" browser stew for a year or two after it came out in 2008, as I was big into Firefox's deep customization and extensions. But eventually the speed of Chrome, and the integration with Android and other Google tools, won me over.

For the last few years it's been a rocky relationship. Google's continual degradation (fave.co/3TDy5ab) of its own Search and YouTube platforms has made this former Android fanboy decidedly lukewarm on the ecosystem. And that's saying nothing of Chrome's more and more memory-hungry footprint, or the deeply questionable shift to a new Google-friendly cookie alternative (fave.co/3LoMCmd). The straw that broke the camel's back was something innocuous, a redesign of the browser tabs that made them chunky and harder to read (fave.co/466VYN9). Once Google broke the undo button for this UI shift in ://flags, it was time for something new.

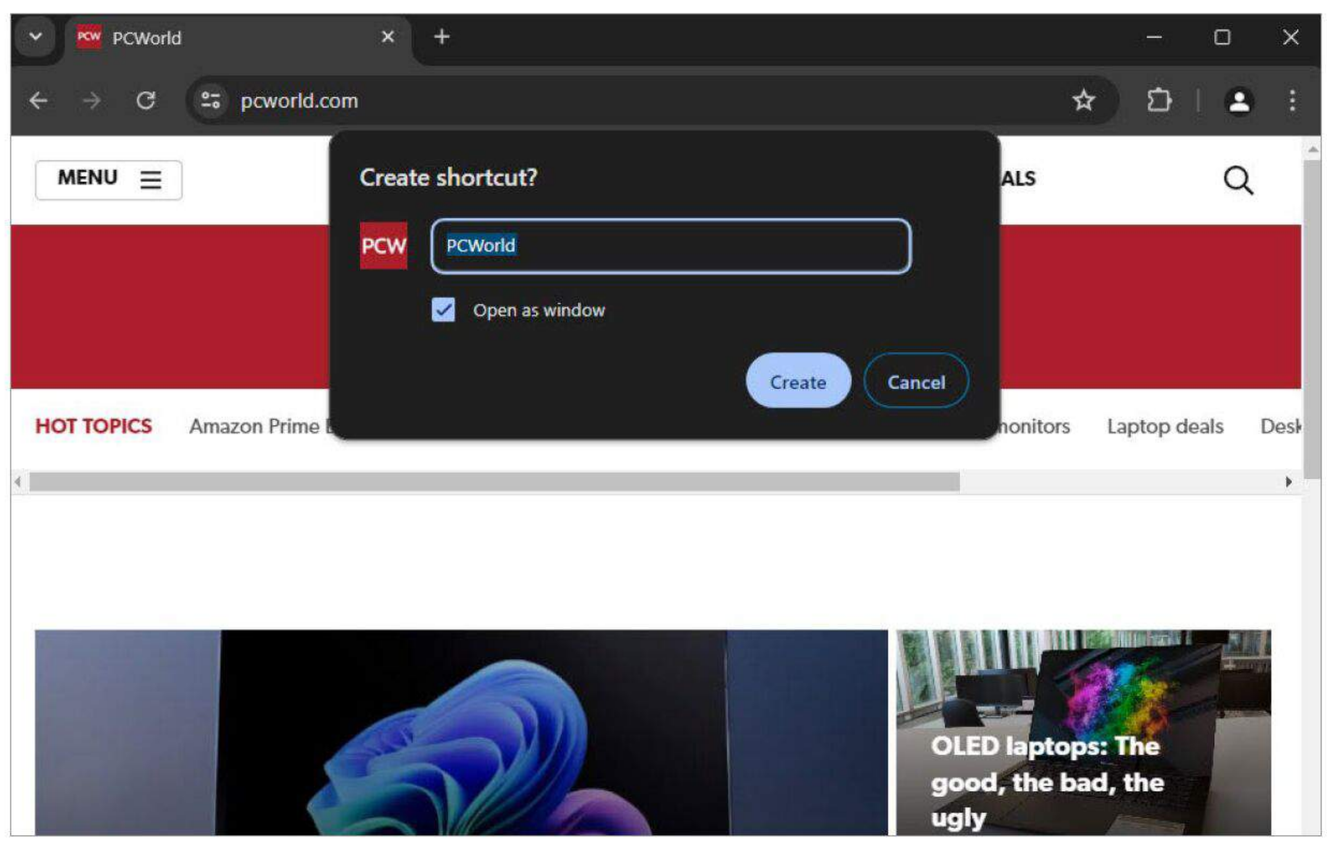
TWO POTENTIAL DEAL-BREAKERS

I've tried to break away from Chrome before, but two things have stopped me cold. One, I need compatibility with Chrome's browser extensions, or at least something that has just as much variety. That's less of an issue now that everything seems to use the Chromium base (fave.co/3zQmYEg). You can even do it with Edge if you want.

The other thing that I need is more subtle, but almost as essential to my everyday workflow: the ability to make dedicated, single-site browser windows. It's my all-time favorite Chrome tool, and something I set up for pretty much any site I rely on throughout the week, including the Google Docs window I'm writing in right now and the WordPress interface I'll use to finish up the article. Most importantly, Windows (and ChromeOS and macOS) treat these as independent applications on the taskbar. Chrome calls it "Open as window" when you create a shortcut to the desktop.



Compatibility with Chrome's browser extensions has prevented me from making the switch earlier.



The ability to open sites as dedicated windows is super important to me…and surprisingly rare among "advanced" browsers.

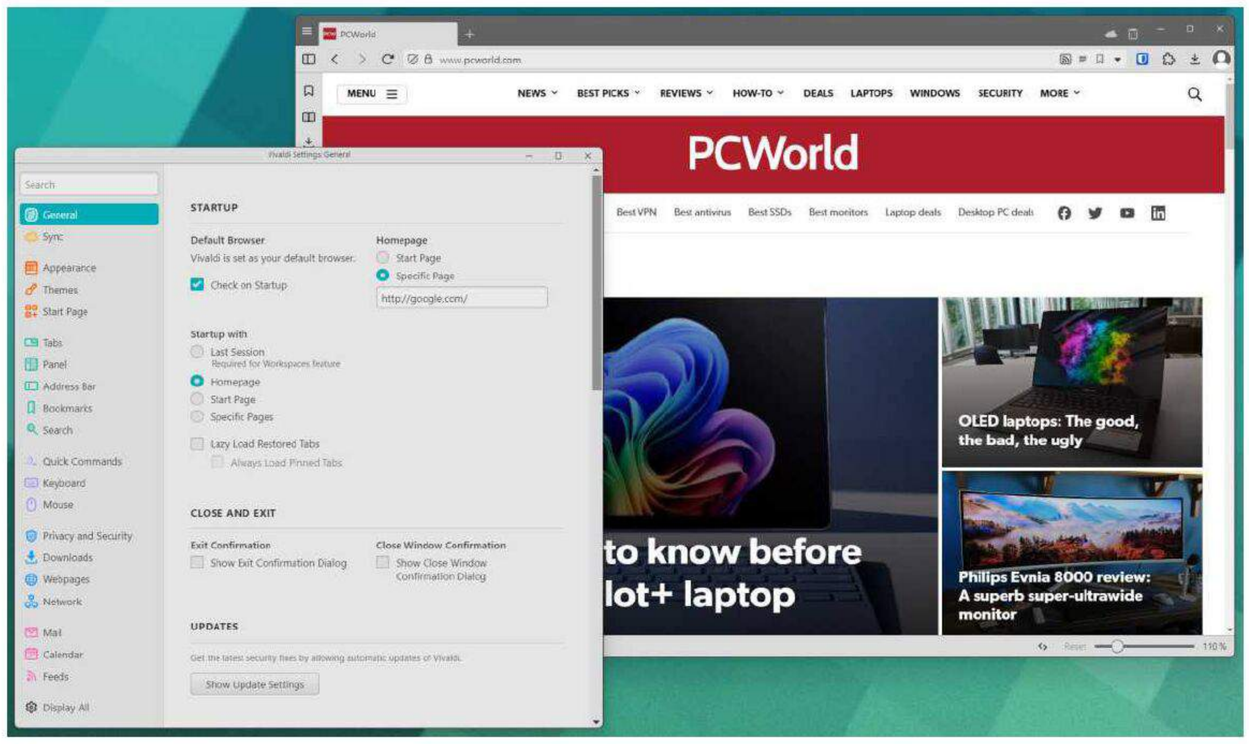
This proved to be a surprisingly elusive feature. Edge can do it, but I ruled it out more or less for spite, since Microsoft's been pulling every dirty trick it can (fave.co/3zI5ytE) to make me use the official Windows browser. I tried Arc, Brave (which I learned has entirely [fave.co/4bP4WQ1] unrelated [fave.co/4eWyILf] issues [fave.co/3XZzOu9]), DuckDuckGo, Opera, and even went back to Firefox for a while. For each of them the open-in-a-dedicated-window feature is either missing or too circuitous to make it worthwhile.

I've tried all of these before. And I've tried Vivaldi before, too—this feature is what put it on the map for me (fave.co/4f0AYeV) after my last unsuccessful attempt at shifting browsers. Vivaldi's speed and stability weren't quite there yet, and I rely on dozens of browser tabs in order to do my job. So I reluctantly returned to my old flame almost exactly two years ago, and let the abusive relationship continue. This time I was determined to make a full break, no matter which browser finally won me over.

Since Vivaldi (fave.co/3S7rAfK) is also based on the open-source Chromium engine and can install Chrome extensions directly from the Google-maintained Chrome Web Store, my two essentials were fulfilled. It was time to give it a full test drive. And after using it almost exclusively for the last two months, on PCs and mobile, I'm ready to commit.

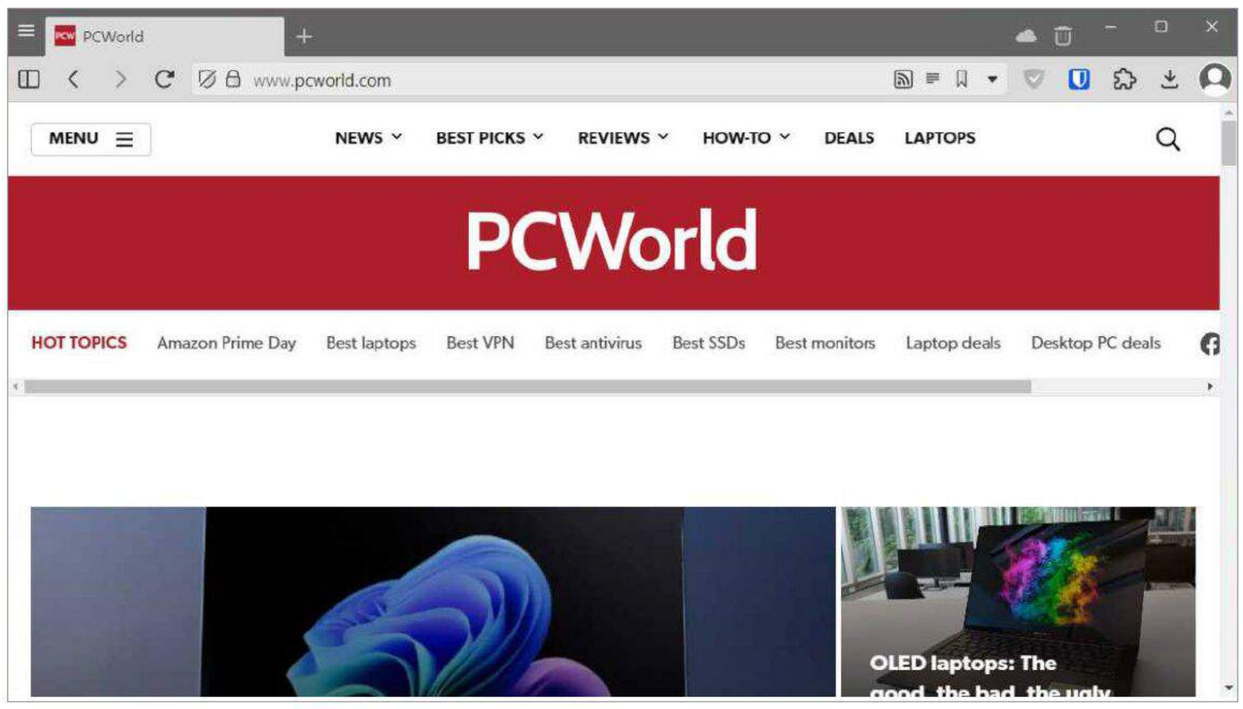
EVERYTHING AND THE KITCHEN SINK

Upon first glance, Vivaldi is a little overwhelming. It uses a kitchen sink approach that throws every conceivable tool at you: It has server-synced settings, tabs, and history. It has a customizable start page and themes. It has built-in clients for web mail, web calendars, and even RSS feeds. It's all visible at all times with a sidebar. It's a *lot*, and this kind of information overload is one of the things that put me off Opera. (That's hardly a surprise: One of the company's founders was also a co-founder of Opera software.)



Vivaldi uses a kitchen sink approach that throws every conceivable tool at you.

But after digging a little deeper, Vivaldi reminded me more of Firefox. Not the Firefox of today, because frankly I haven't used it seriously in so long that I couldn't make that judgment. No, it reminded me of Firefox almost 20 years ago, back when I'd spend hours in my college dorm room tweaking settings and digging through themes on DeviantArt when I should have been studying.



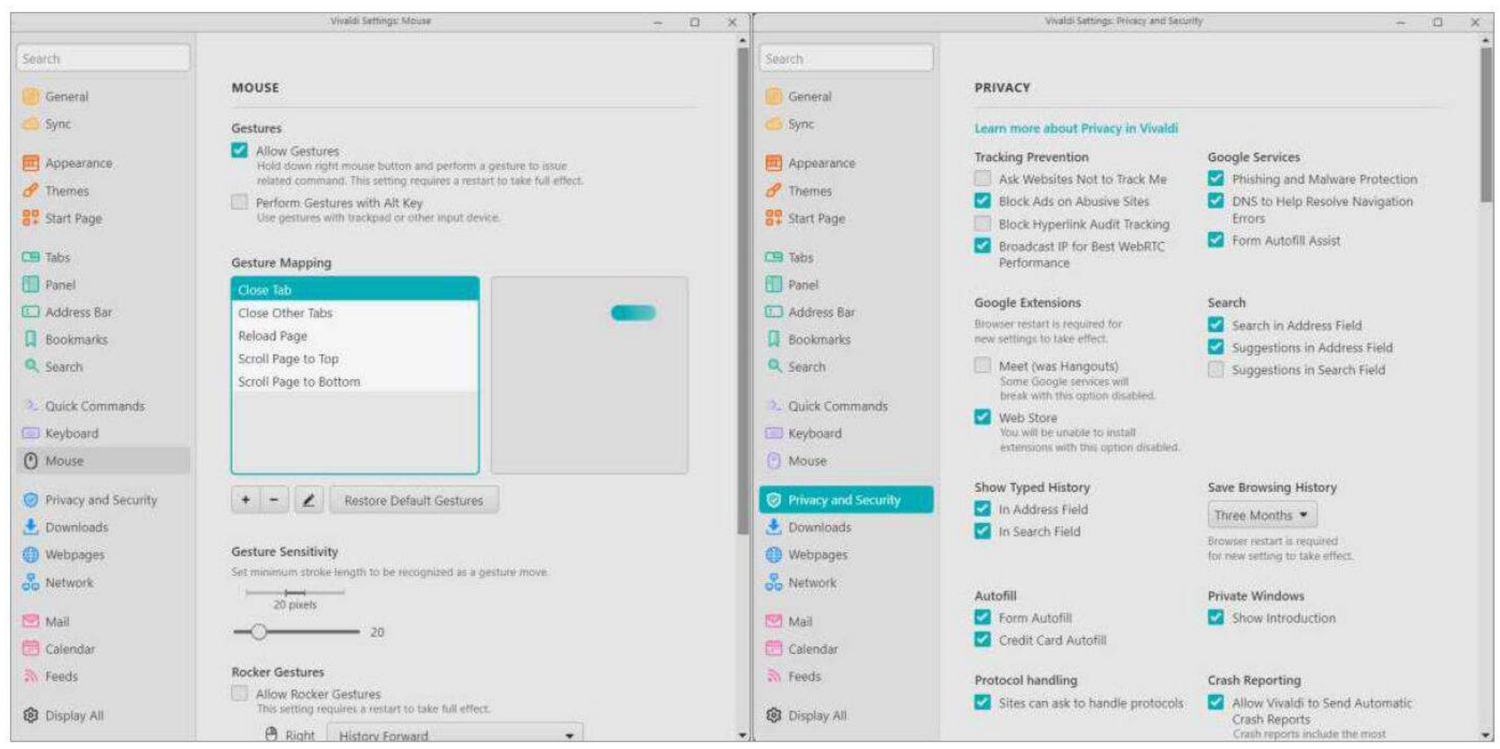
Vivaldi lets you turn off the things you don't use, like those mail and calendar tools.

Vivaldi lets you hide the side panel, an apparently essential part of its workflow. Vivaldi lets you turn off the things you don't use, like those mail and calendar tools. Vivaldi builds in some of the tools I've spent years relying upon extensions for, like mouse gestures for common actions. Vivaldi lets you tweak and trim down almost every aspect of how it interacts with the user, in ways that Chrome—despite originating as an open-source project—doesn't even trust power users to touch anymore.

AN IDEAL MIX OF POWER AND VERSATILITY

After a month, I'm finding that there's nothing I want to do with Vivaldi that I can't, and nothing that it wants me to do that it insists upon. It takes a while to learn where everything is, but everything *is* there. It's refreshing to be trusted as a computer user—Windows could take some notes (fave.co/3IhGcnE), in fact.

Since I'm splitting with Chrome, I decided to make it a true split, and ditch it on my phone as well. While the mobile version of Vivaldi (fave.co/4d1Ea8d) lacks a lot of its more memory-intensive tools,



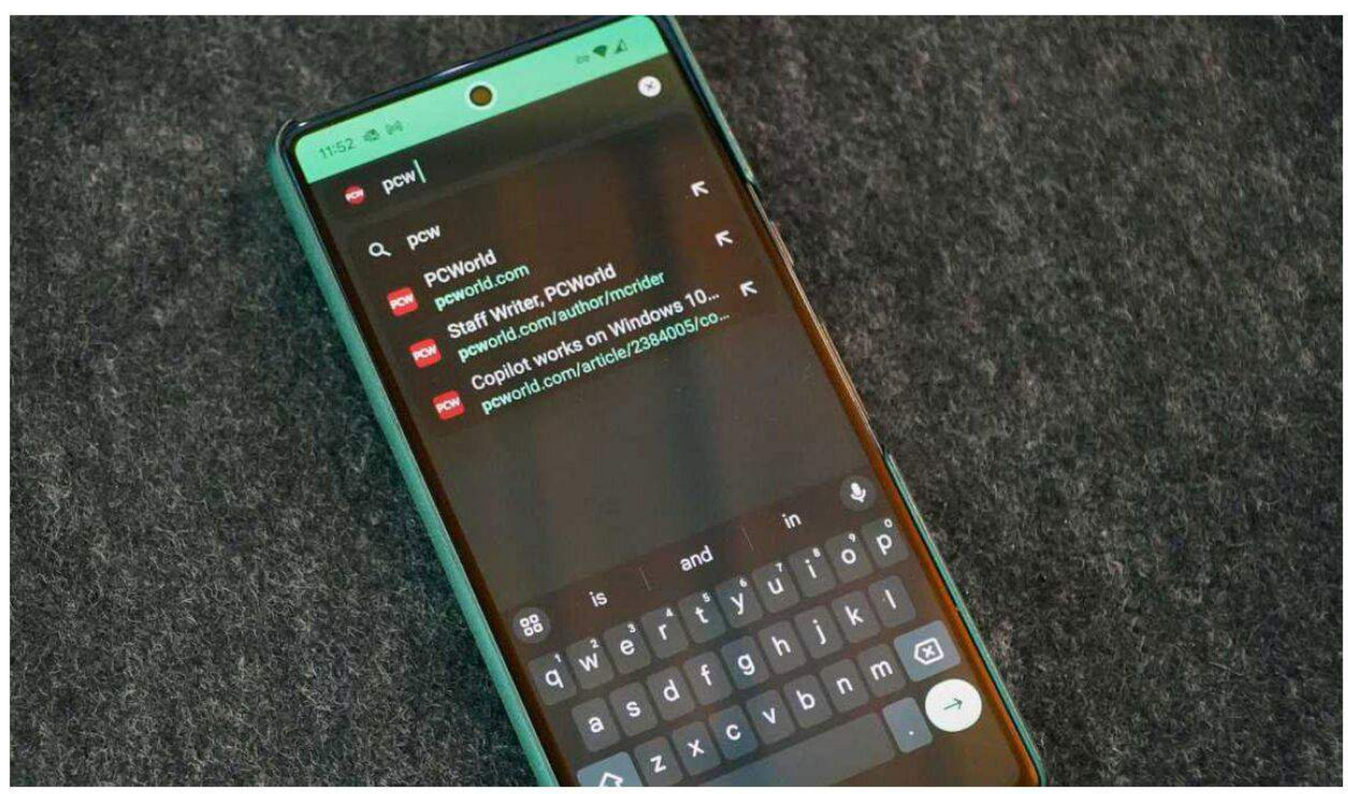
You probably don't need all of Vivaldi's features, but a few have replaced my Chrome extensions, like mouse gestures.

But since we're talking about software developed by a few dozen people instead of hundreds (or possibly even thousands), a few hiccups are both expected and forgivable.

I've found that it does something I've been begging Chrome to do for years: let me use the search shortcuts I'm used to on the desktop on mobile. So even on my phone, I can add a "w" in the URL bar to instantly search Wikipedia, or "az" for Amazon, or even "pcw" to search through the PCWorld archive. And all of these settings sync over in the browser's built-in tool. This kind of trust is something I've been missing from my browser for a long, long time.

Vivaldi isn't perfect. It's a little pokier than Chrome when I have dozens of tabs going (and I often do), and every once in a while I run into a weird bug where it wants a confirmation click for opening a new window.

I don't think Vivaldi is for everyone. But if you're a regular PCWorld reader, if you know how to upgrade your own RAM, if you're not afraid of tweaking some registry files, et cetera, it might be for you. It has let me finally end my contentious relationship with Chrome (if not with Google) once and for all, and for that I'm extremely grateful.



The ability to use search shortcuts in the URL bar is something I haven't seen in other mobile browsers, including Chrome.

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7 warning signs your computer has been hacked, and what to do

If something doesn't seem right, it's time to run some scans. **BY CHRIS HOFFMAN**

Your antivirus will protect you from many online threats, but no antivirus is perfect. Truth is, your PC can still be hacked even if you're using reputable security software with a solid track record.

When we talk about your computer possibly being hacked, that's exactly what we mean: A cybercriminal has gained access to your PC and compromised it in some way.

The hacker in question may be a criminal organization that's installing malware on millions of PCs (for instance, to spy on you and steal your credit card numbers), or the hacker may be an individual using a remote access Trojan (RAT) to personally spy on you through your webcam.

Here some common warning signs that your PC might've been hacked, exposing your personal data and system resources.

IMAGE: ANDREY_POPOV/SHUTTERSTOCK

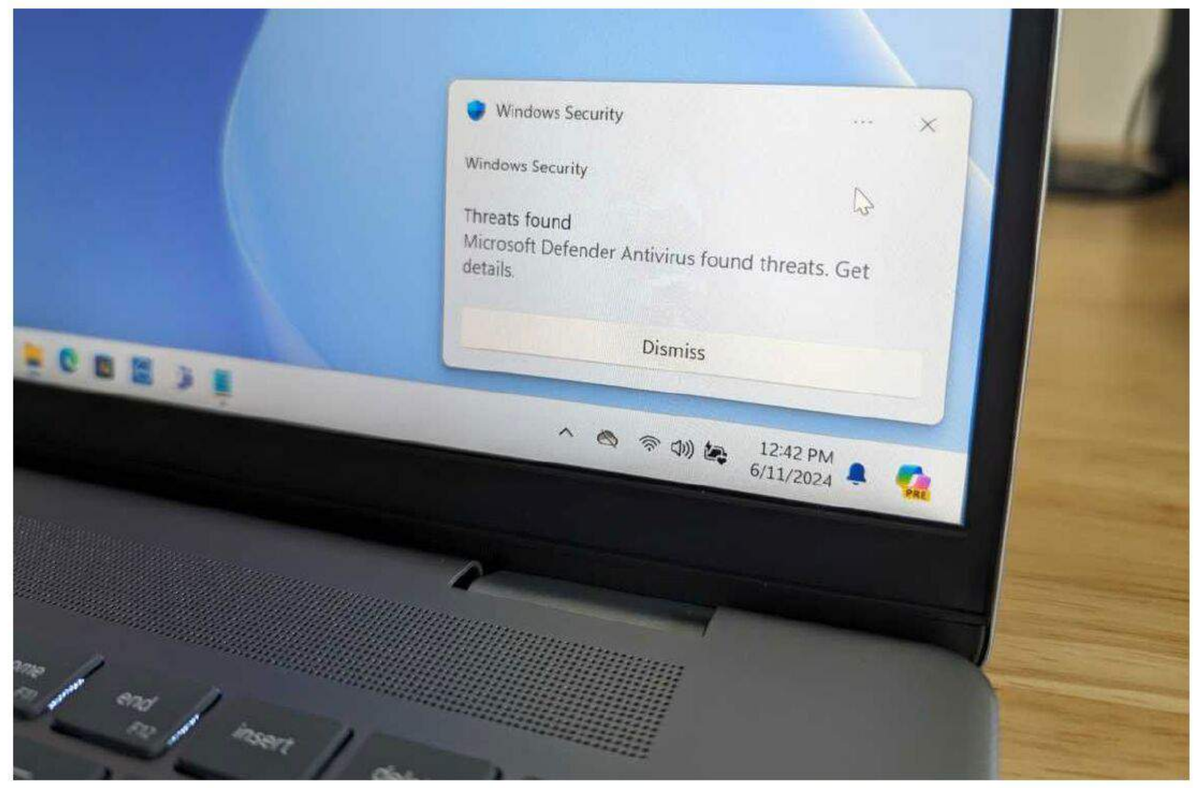
IS SOMETHING FISHY? RUN AN ANTIVIRUS SCAN

First things first: If you're concerned that your computer has a virus or another type of malware, you should run a scan with an antivirus program—ideally one of our recommended antivirus software picks (fave.co/3CnDHuk).

You should also consider using the free Norton Power Eraser (fave.co/3LId3t4) or a similar tool. Such tools will reboot your PC into a special scanning environment outside of Windows so they can spot and remove malware (fave.co/4bbTiPN), like rootkits that normally evade detection.

Perhaps you've already run a scan. If your scan didn't find anything wrong but you're still concerned, I recommend getting a second opinion.

Beyond that, let's dig into the actual signs you may have a problem with viruses, worms, rootkits, keyloggers, Trojans, crypto-miners, ransomware, or other dangerous malware on your Windows computer.



Warnings from your antivirus can be a sign that an attacker has gained access to your PC.

1. ANTIVIRUS WARNINGS AND OTHER MESSAGES

Warnings from your antivirus—whether that's the Windows Defender antivirus (fave.co/462uHLJ) built into Windows itself or another antivirus you've installed—can be a sign that an attacker has gained access to your PC.

If you see lots of notices about a virus or other malware being detected, that's a real sign that *something* is wrong. Even if your antivirus continues to insist that the malware was removed, if it keeps happening over and over, you should be suspicious.

It's possible that your antivirus is only doing a partial cleanup. Whoever has hacked your system may have a foothold on your system that your antivirus software isn't catching.

Meanwhile, strange messages saying that your antivirus is disabled are also a problem. An attacker who hacked your PC may have disabled your antivirus to stop it from getting in the way.

2. WEBCAM LIGHT MYSTERIOUSLY ON

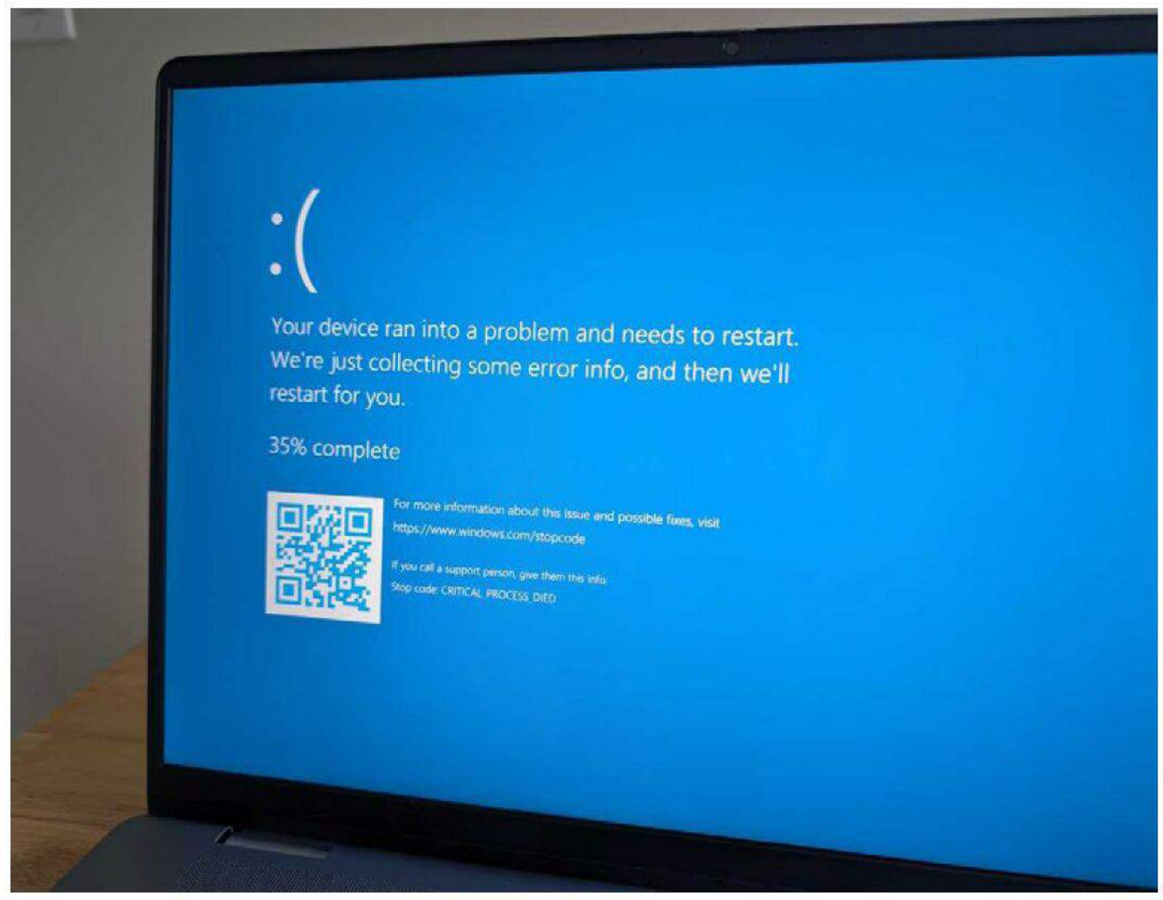
If your computer's webcam light is ever on and you don't know why,

that's a big problem, and you should find out why. If you can't pin down the cause, a hacker may be involved.

If someone is using a remote access Trojan (RAT) or some other kind of malware that spies on you through your webcam, you'll usually see a webcam light indicating the camera is in use. (Some laptops and PCs don't have webcam lights, but they may still show you that your webcam is in use with a system tray icon.)

You may be able to see which application is using your webcam from your PC's Settings app, but unfortunately malware can hide from this list.

It's also possible that you've left a videoconferencing app running in the background, of course—and that's also something you'll want to know about! Here's a guide for taking control of your webcam privacy (fave.co/3S7EI4C).



Another sign something isn't right is if Windows keeps freezing or your apps keep crashing.

3. UNUSUALLY SLOW PERFORMANCE

If your computer was hacked and malware is running on it, you may see slow performance. Applications may take a long time to open, web pages may take a long time to load, and things may just feel sluggish.

This can happen if a lot of malware is running on your PC or if you have a specific type of malware that's draining your system resources. For example, crypto-mining malware may use all your CPU and GPU resources to mine cryptocurrency, slowing everything to a crawl.

You can dig into the Windows Task Manager to see exactly what's consuming resources, but Windows has a lot of legitimate background processes that could be using lots of system resources. For example, things can slow down while installing updates.

So if performance seems low and your computer is crunching away on something in the background, it may not mean you have malware—but it's definitely worth looking into.

4. COMPUTER FREEZES AND APPLICATION CRASHES

If Windows keeps freezing or your apps keep crashing, that's another sign that something isn't quite right.

Malware that digs deep into the Windows operating system may install drivers or interfere with the Windows kernel, which can cause system instability in the form of blue screens, crashes, and freezes. It may also interfere with the applications you use, causing them to crash.

This isn't foolproof evidence that your computer has been hacked, though. Blue screens can be caused by hardware problems, and application crashes can be due to the application itself. But if you can't figure out the root cause, malware should be on your radar.

5. STRANGE APPLICATIONS AND POPUPS

If you're getting a lot of weird popups (like browser popups) or other weird, unexpected applications showing up, that could be a sign someone with access to your PC—or just malware running in the background—is installing that junk on your PC.

Of course, even this isn't a way to know for sure. PCs often come with a lot of manufacturer-installed applications you may not recognize, and some applications you use may create popups.

Popups of a text-mode Command Prompt window quickly appearing and vanishing should be suspicious, but some legitimate applications create popups like this one when they install updates.

6. CHANGES TO BROWSER HOME PAGE, SEARCH ENGINE, OR EXTENSIONS

Adware, spyware, and other junkware (junk software) have historically been known to take over web browsers.

When they do, these nasty forms of malware may change your browser home page and default search engine to capture more advertising revenue. They may also install browser extensions to spy on your web activity, capture information, and insert more ads into web pages.

If your browser has strange changes like these, that's a sign your computer may be compromised in some way. You can reset your browser, but it's also a good idea to run a deeper scan to root out the malware.

7. ODD EMAILS BEING SENT AND RECEIVED, PASSWORD CHANGES, AND MORE

Hacks aren't just about access to your computer. Hackers also want access to your various online accounts.

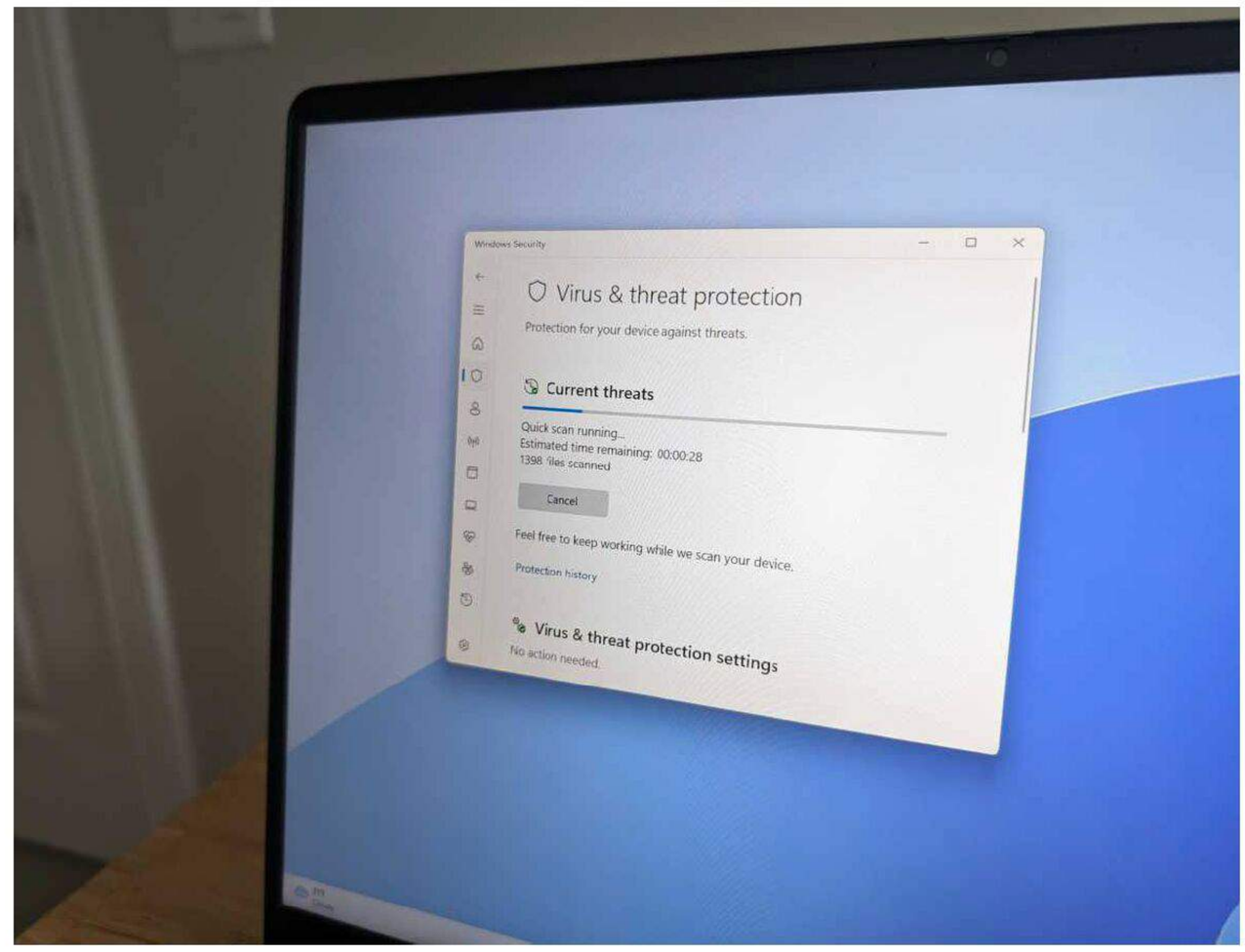
One of the most common ways accounts are hacked doesn't even involve hacking a computer at all. The attacker may discover a password you use—possibly a password that you reuse everywhere, which ended up leaked in a data breach somewhere.

Then the attacker uses your username and password combination to see if they can gain access to your other accounts. If the service

allows the attacker in with your leaked credentials, they've essentially hacked your account. That's why reusing passwords is so dangerous (fave.co/463wiRx) and why enabling two-factor authentication is so helpful (fave.co/41SY7rQ).

If you see strange emails being sent and received, or if your account passwords are suddenly reset, it could be the result of a hack. Someone with access to your computer (or someone who knows your passwords) may have gained remote access to your accounts.

If malware scans come up clear and your computer seems secure but you still see strange things like this, it's a good idea to change your passwords just in case.



If something seems wrong, always run a scan.

BE ON ALERT AND TRUST YOUR GUT

To be clear, this isn't an exhaustive list. There may be other warning signs of hacks and/or malware. What's even scarier is that a particularly well-executed hack may not leave any signs at all.

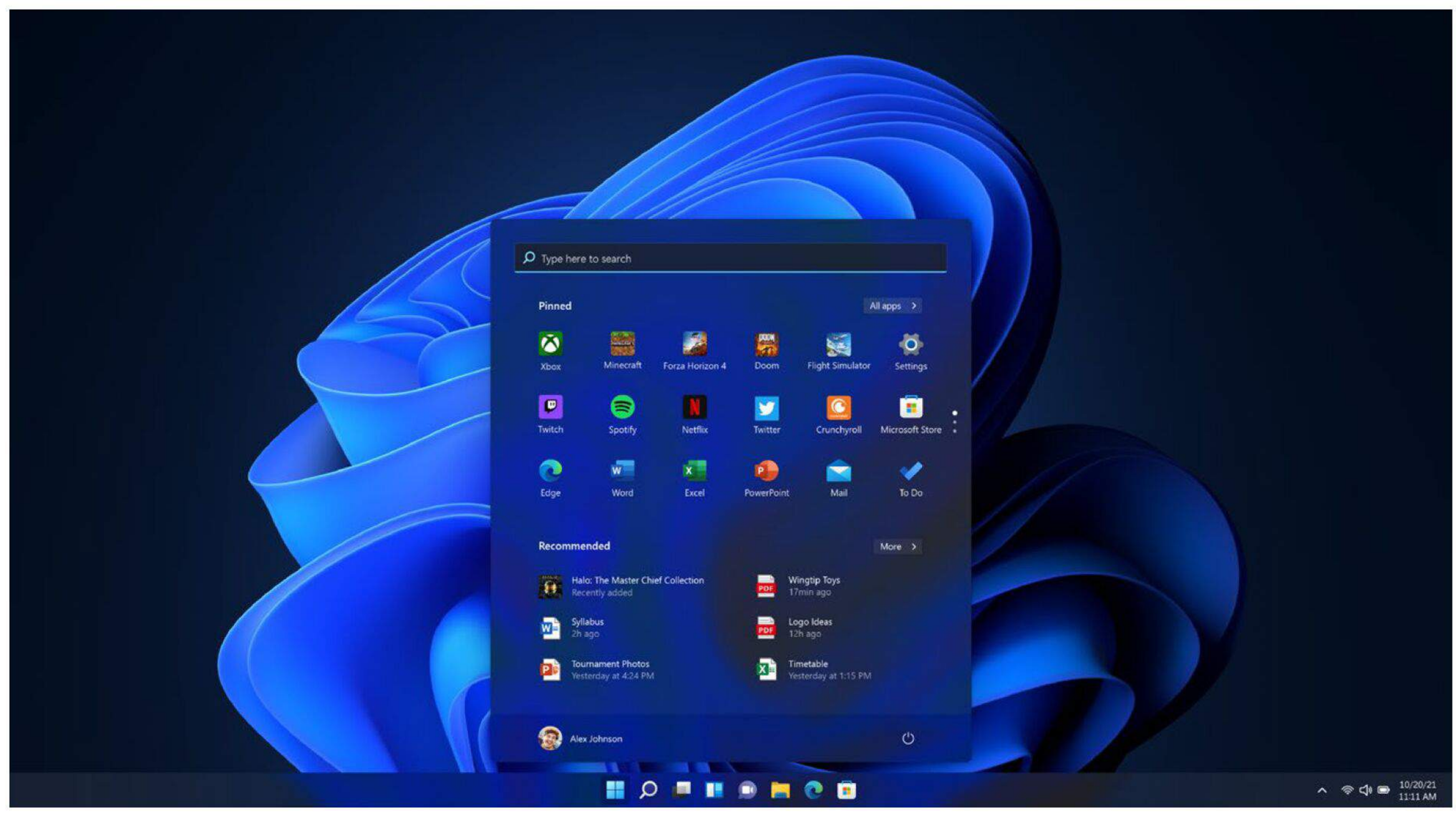
A sophisticated attacker doesn't want to be noticed at all. They want to quietly spy on you and steal important data, and they're going to do their best to ensure their hack doesn't affect your PC in any noticeable way so they can remain undetected. That's a big difference from the bog-standard malware that will be happy to waste your PC's resources just to mine some cryptocurrency.

Ultimately, the best answer is to trust your gut. If something seems wrong, run scans with the various antivirus programs we recommend.

If nothing comes up and you're still concerned, consider resetting your PC (fave.co/3ohXfzb). This is basically like reinstalling Windows—you'll get a "factory default" setup and you can set everything up again. This process will remove any malware or other hacker tools that could be lurking on your system, but you'll have to reinstall the programs you use and set things up again afterward. Still, that's a small price for peace of mind.

This clever tip alerts you when apps are added to Startup in Windows 11

Did you know Windows 11 can immediately inform you when an app is added to the autostart list? **BY HANS-CHRISTIAN DIRSCHERL**



The Startup page in Windows 11's Settings is really useful for toggling which apps autostart when you boot the system. But the more apps you have enabled in Startup, the longer it takes for Windows to be fully usable after restarting. That's why it's good to check the Startup page every so often and disable unwanted apps.

Or you could simply enable a built-in notification that alerts you whenever new apps are added to Startup. Here's how to configure Windows to notify you when new Startup apps appear.

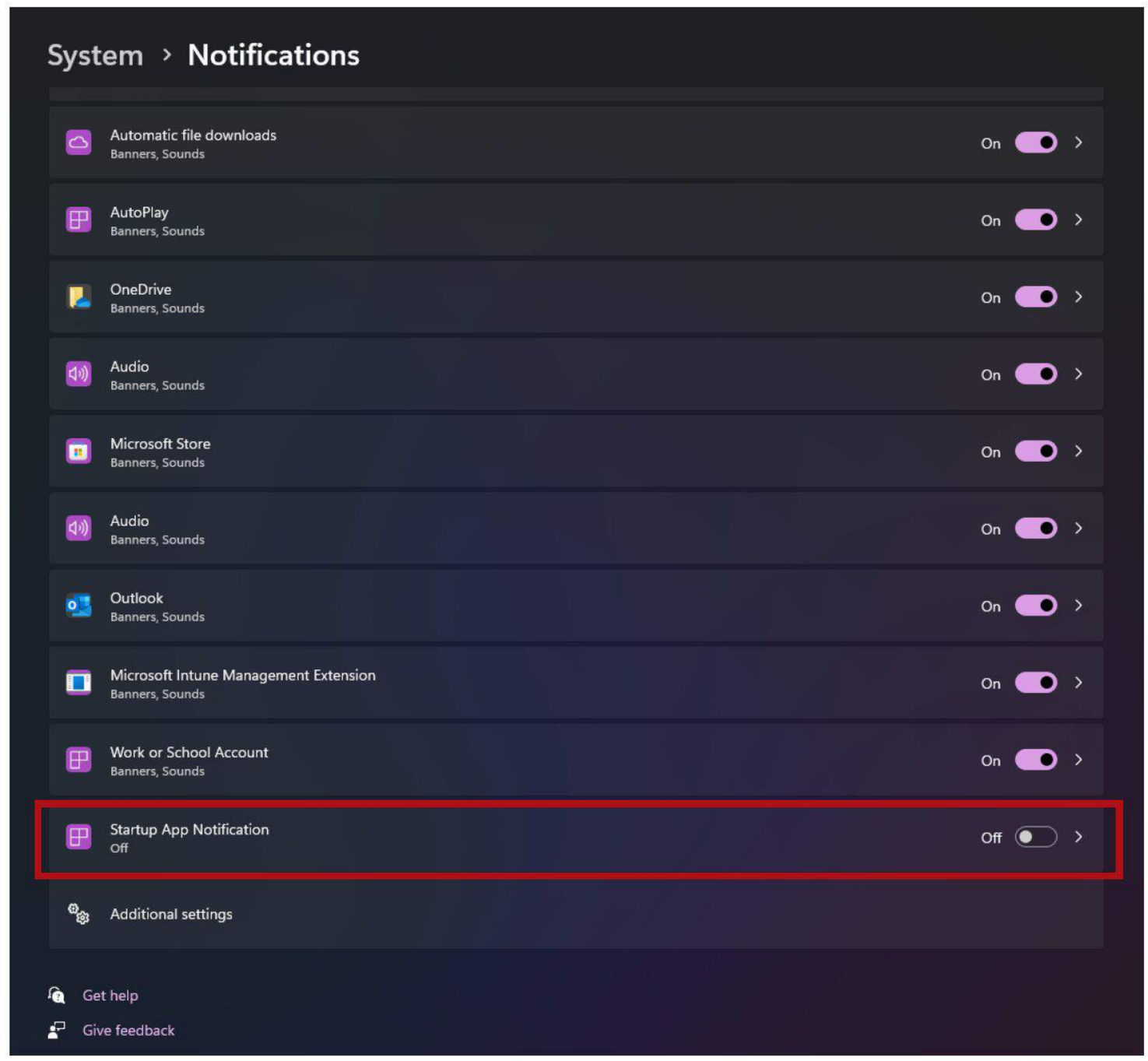
ENABLE ALERTS WHEN NEW STARTUP APPS ARE ADDED TO WINDOWS 11

Open the Windows 11 system settings, click on System in the left sidebar, then select the Notifications section on the right. The

IMAGE: MICROSOFT

settings page for notifications will now open. Scroll down to the bottom of the notifications page. Just above Additional settings, you'll see the item we want: Startup App Notification, which is switched off by default. Move the slider to On.

From now on, you will receive a notification whenever an application is added to the Windows startup process. You can configure what this notification looks like by clicking on the arrow next to the slider button, and you can also tweak the notification's sound.



Startup App Notification is switched off by default, as shown here. You'll need to move the slider to On.

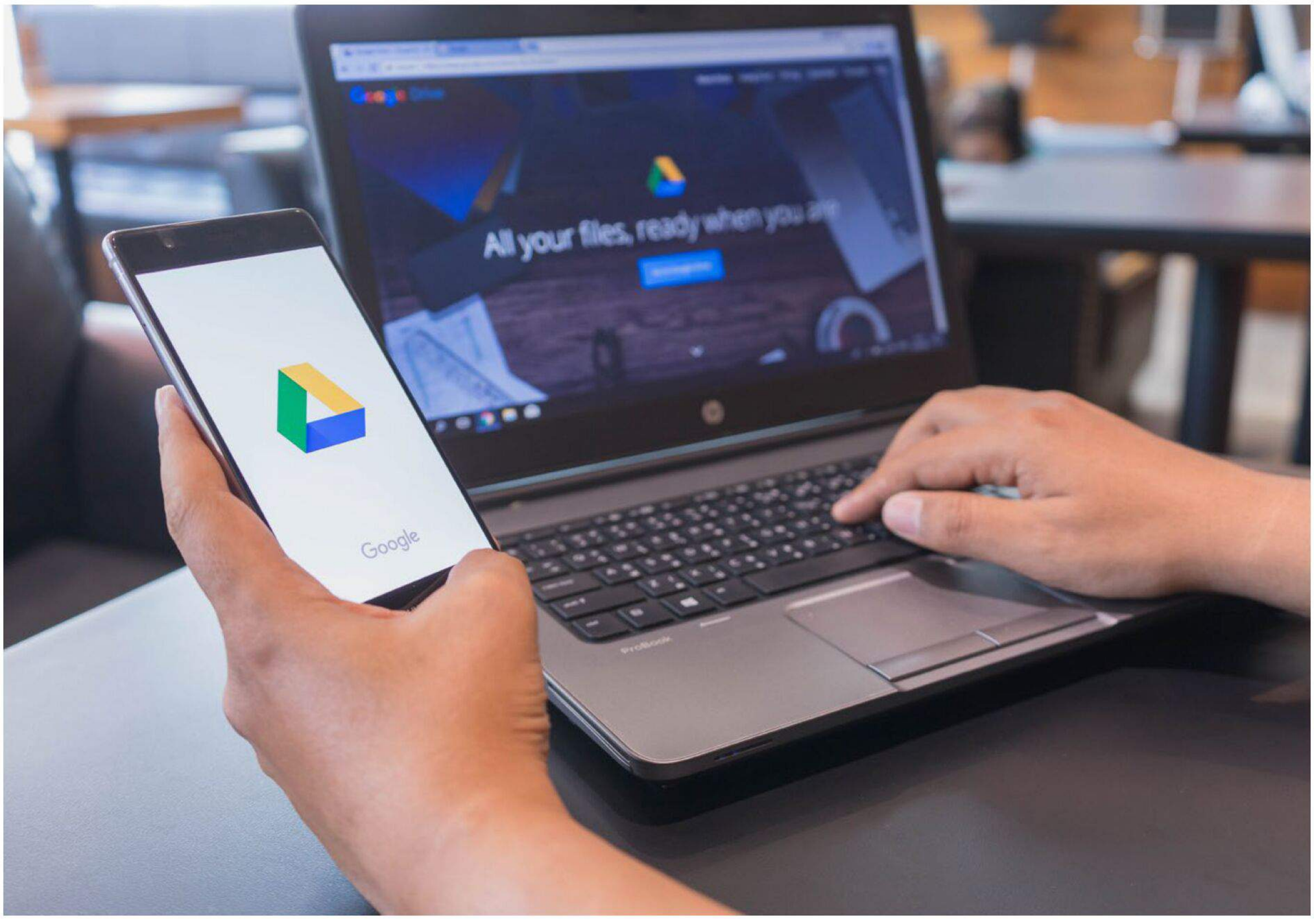
Note that Windows notifications need to be enabled for this to work. If you've disabled notifications, or if you're in Do Not Disturb mode, then you won't get these new Startup app alerts.

MANAGING STARTUP APPS IN WINDOWS 11

When you install new programs, many of them either add themselves to the Startup page or ask for permission to do so. As more and more programs are automatically started with Windows, the entire startup process can bog down to a frustratingly slow speed.

You can check which apps are in Startup via Task Manager. Press Ctrl + Shift + Esc to launch Task Manager. Then, in the left sidebar, select the tab titled Startup apps.

Here you'll be able to see how much impact each app has on the system bootup process, and you can toggle each one by selecting it and clicking either Enable or Disable at the top right.



Google Drive storage still full after deleting files? Here's why

Here's the solution for when deleted files continue to take up storage space in Google Drive. **BY FLORIAN KASTNER**

If your Google Drive storage is reaching its limits, you'll need to clear out old and unused files to free up space. But what if you've already deleted files and your Google Drive capacity is still just as full? Here's what you need to know about why this happens and what you can do to fix the problem.

GOOGLE DRIVE STORAGE SPACE DOESN'T FREE UP AFTER DELETING FILES

It can be puzzling when you remove files from Google Drive and see that your storage capacity isn't affected. The reason for this is simpler than you might think: Deleted files are actually just moved to Trash, where they

IMAGE: NOPPARAT KHOKTHONG/SHUTTERSTOCK

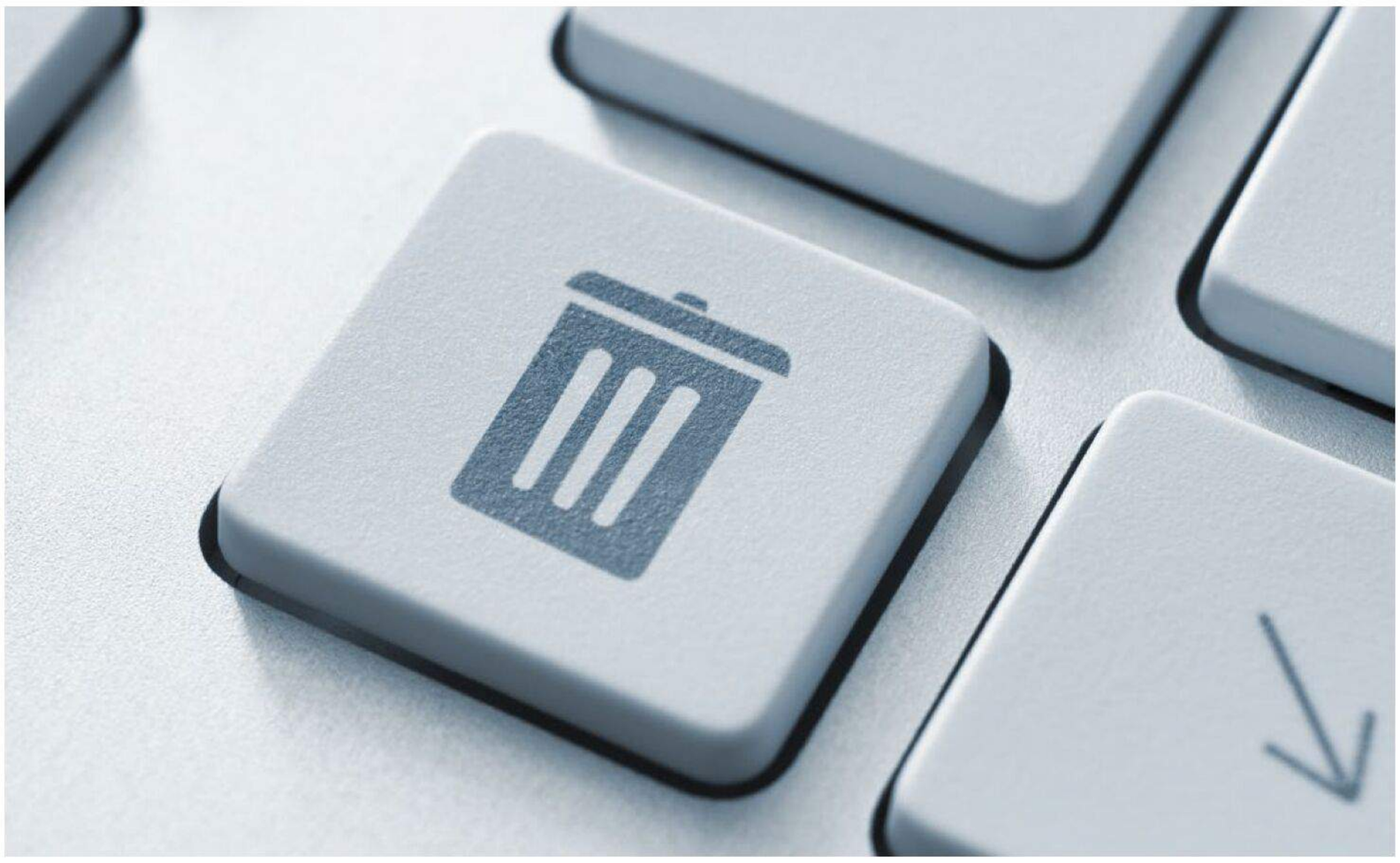


IMAGE: ANTLII/SHUTTERSTOCK

Normally, Google Drive keeps deleted files in Trash for 30 days before actually deleting them.

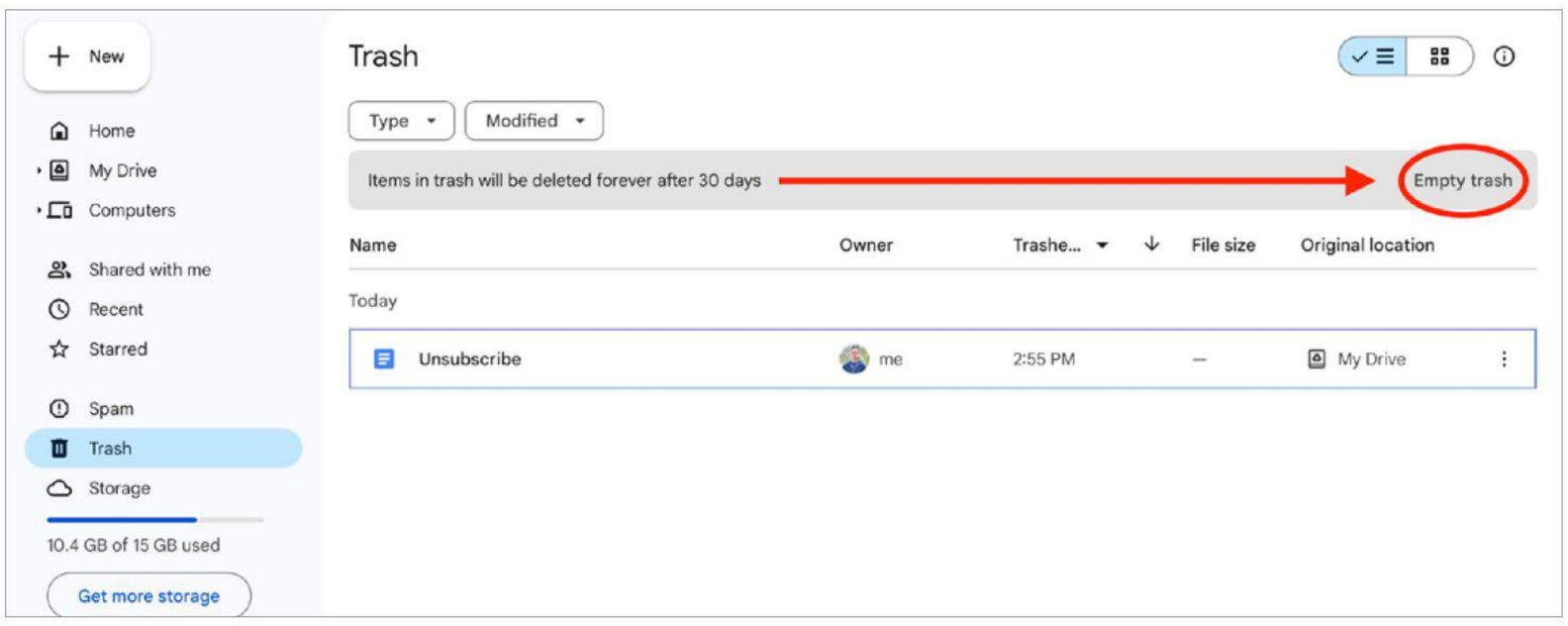
continue to take up storage space. Google does it this way because it's a security measure that prevents users from accidentally deleting important files.

Normally, Google Drive keeps deleted files in the Trash for 30 days before actually deleting them. This gives you enough time in case you change your mind and need to retrieve deleted files. But if you need to free up storage space right away, you don't have to wait. You can empty the Trash manually.

EMPTY GOOGLE DRIVE'S TRASH TO IMMEDIATELY FREE UP STORAGE SPACE

To do this, go to Google Drive in your browser and click on Trash in the left sidebar. Here, you'll find the "Empty trash" button. Click on it, then confirm your choice by clicking Delete forever.

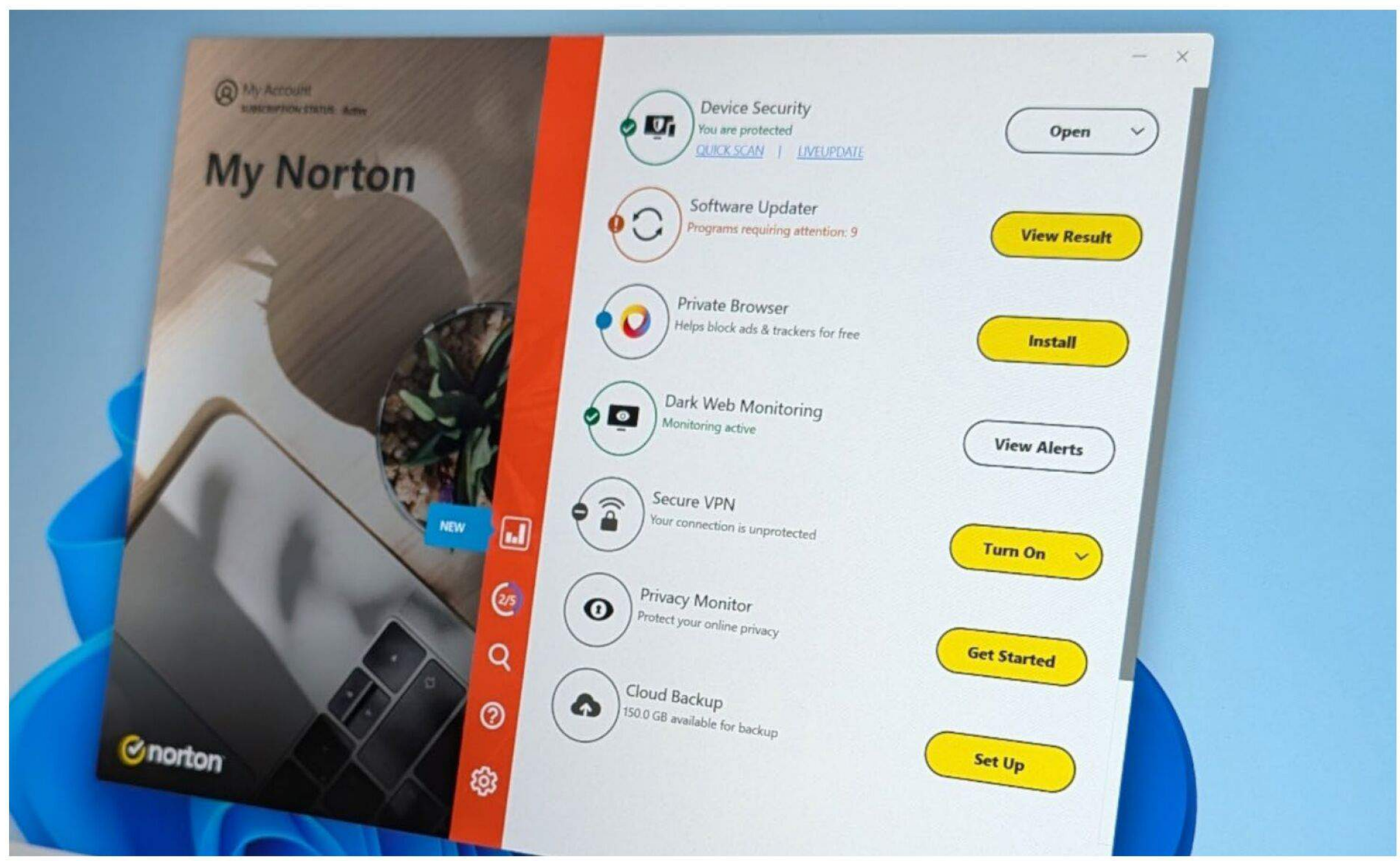
This permanently removes all content in the Trash and immediately frees up storage space in your Google Drive account.



You can also empty your Google Drive recycle bin manually anytime.

Norton 360 antivirus: 5 settings to change first

Make the most of PCWorld's top-rated antivirus software with these quick tweaks. **BY CHRIS HOFFMAN**

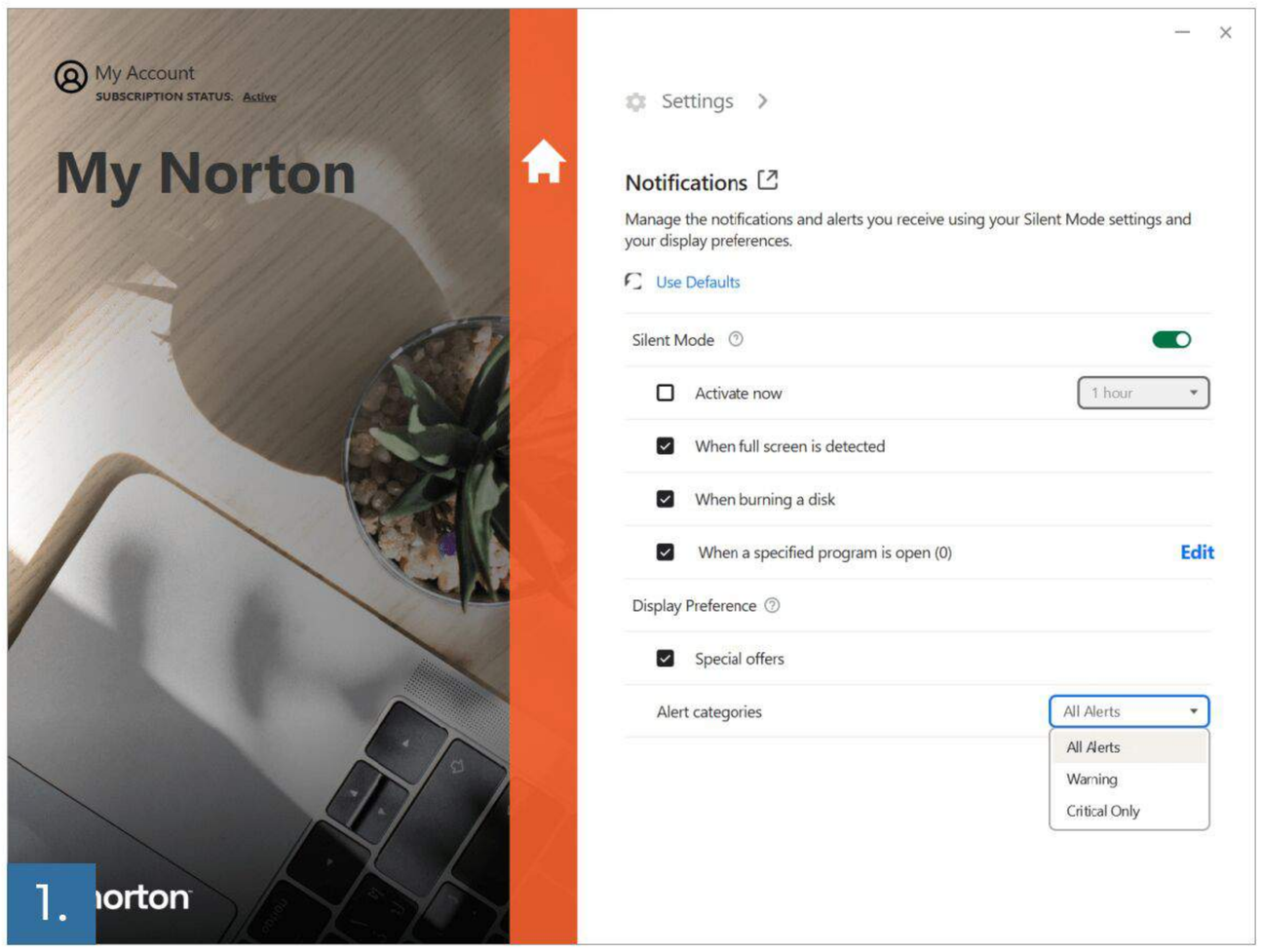


Norton 360 antivirus (fave.co/30Bk59o) protects you out of the box, automatically blocking malware and even preventing suspicious-looking programs from accessing your webcam (fave.co/3S7EI4C) without your permission. Those are just basic security features, though. Some of Norton 360's most useful features (fave.co/4d4fagF)—cloud backups, VPN, dark web monitoring, a built-in software updater—won't do anything until you set them up.

Here are the first settings you should change after installing Norton 360 if you want to take full advantage of this security suite.

Note: To find these settings, open the Norton 360 application from either your Start menu or system tray. You'll see a My Norton window, where you can find Norton's features and options for controlling them.

IMAGE: NOPPARAT KHOKTHONG/SHUTTERSTOCK



By default, Norton 360 will show you occasional offers. Uncheck the Special offers box if you don't want to see those.

You can also customize Silent Mode here, if you like, but the default settings are pretty good. For example, Norton 360 automatically activates Silent Mode whenever you're in a full-screen application and won't interfere with activities like gaming or video streaming.

1. CHOOSE HOW MANY NOTIFICATIONS YOU WANT TO SEE

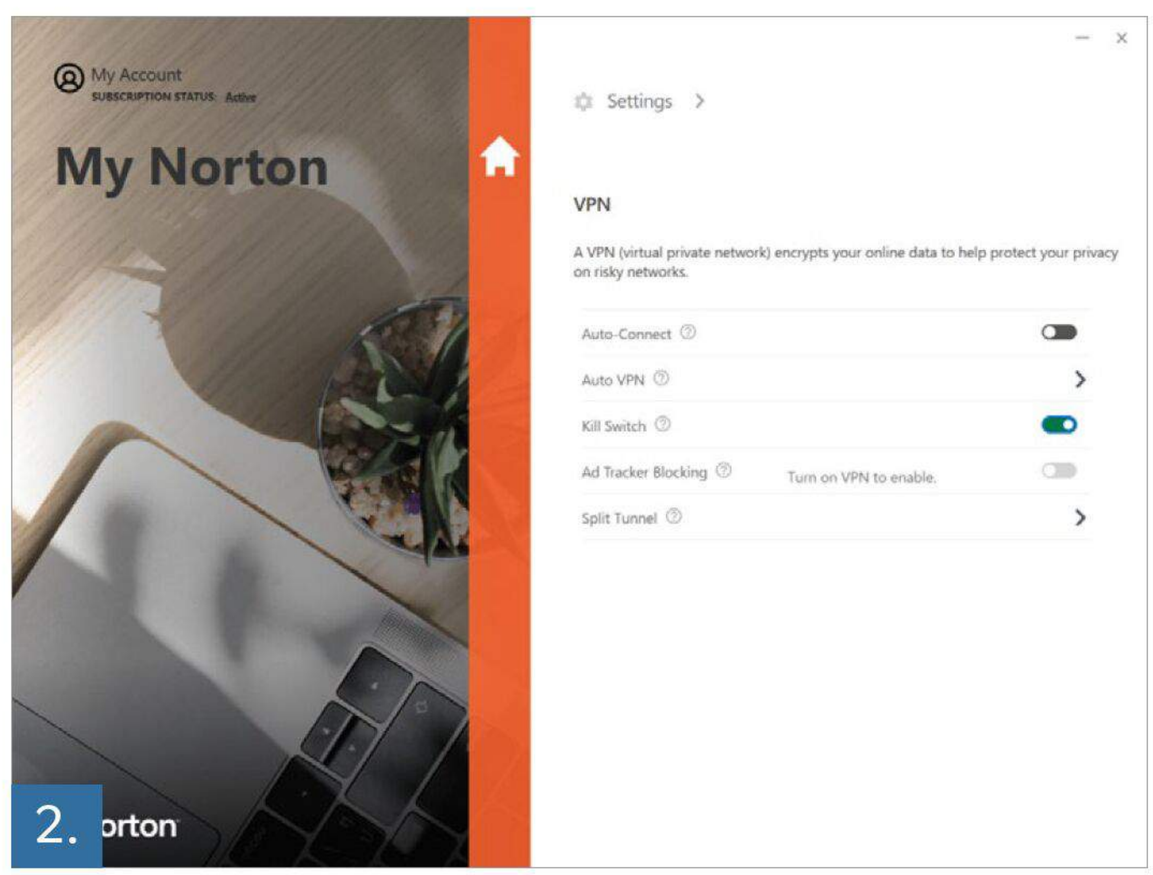
Like other security suites, Norton 360 can be a little noisy out of the box. This is a matter of personal taste: Some like seeing these notifications, others would prefer to see as few as possible.

Want to take control? You can customize your Norton 360 notifications by clicking the gear icon in the middle of the My Norton window to access settings, and then click Notifications.

Look under Display Preference. The "Alert categories" box is set to All Alerts out of the box. To see fewer notifications, click that box and select either Warning or Critical Only.

2. CONFIGURE HOW THE BUILT-IN VPN WORKS

Norton 360 has a built-in Norton Secure VPN feature, which can route all your internet traffic through a secure tunnel. This means you don't need a separate VPN service or subscription (fave.co/3FtTTMs)—but Norton



doesn't automatically activate its VPN after installation, so you have to do it.

Note: The Norton Secure VPN is included with most versions of Norton, including Norton 360 Deluxe and Norton 360 Standard. However, it's not included with the baseline Norton Antivirus Plus subscription (fave.co/3xSbDmO).

To control how the Norton Secure VPN works, click the gear icon in the My Norton window and select VPN, or click the down arrow to the right of Secure VPN in this window and select Settings.

From here, you can control how you want the VPN to work. Here are the VPN features (fave.co/4cM6wU8) you can tweak:

Auto-Connect: Activate this switch to use the VPN all the time. The Norton Secure VPN will automatically connect whenever your computer boots or wakes from sleep mode. (Bear in mind that this will likely slow things down a little bit. There's always a little bit of overhead to using a VPN.)

Auto VPN: Rather than use the VPN at all times, Norton 360 can automatically activate it when you connect to an unsecured or compromised Wi-Fi network—for example, a public Wi-Fi network with no encryption that might be vulnerable to snooping. Activating this option is a great way to boost security on public Wi-Fi networks without slowing down your connection at home.

Kill Switch: Activate this and Norton 360 will automatically block all network traffic whenever the VPN connection isn't live. This is useful for unexpected disconnects, as you'll maintain privacy and security without accidentally leaking traffic while the VPN reconnects.

Ad Tracker Blocking: Norton Secure VPN can automatically block advertising-related trackers while the VPN is connected.

Split Tunnel: Norton 360 will let you exclude certain applications from the VPN tunnel, letting just those applications connect directly to the network and bypass the VPN.

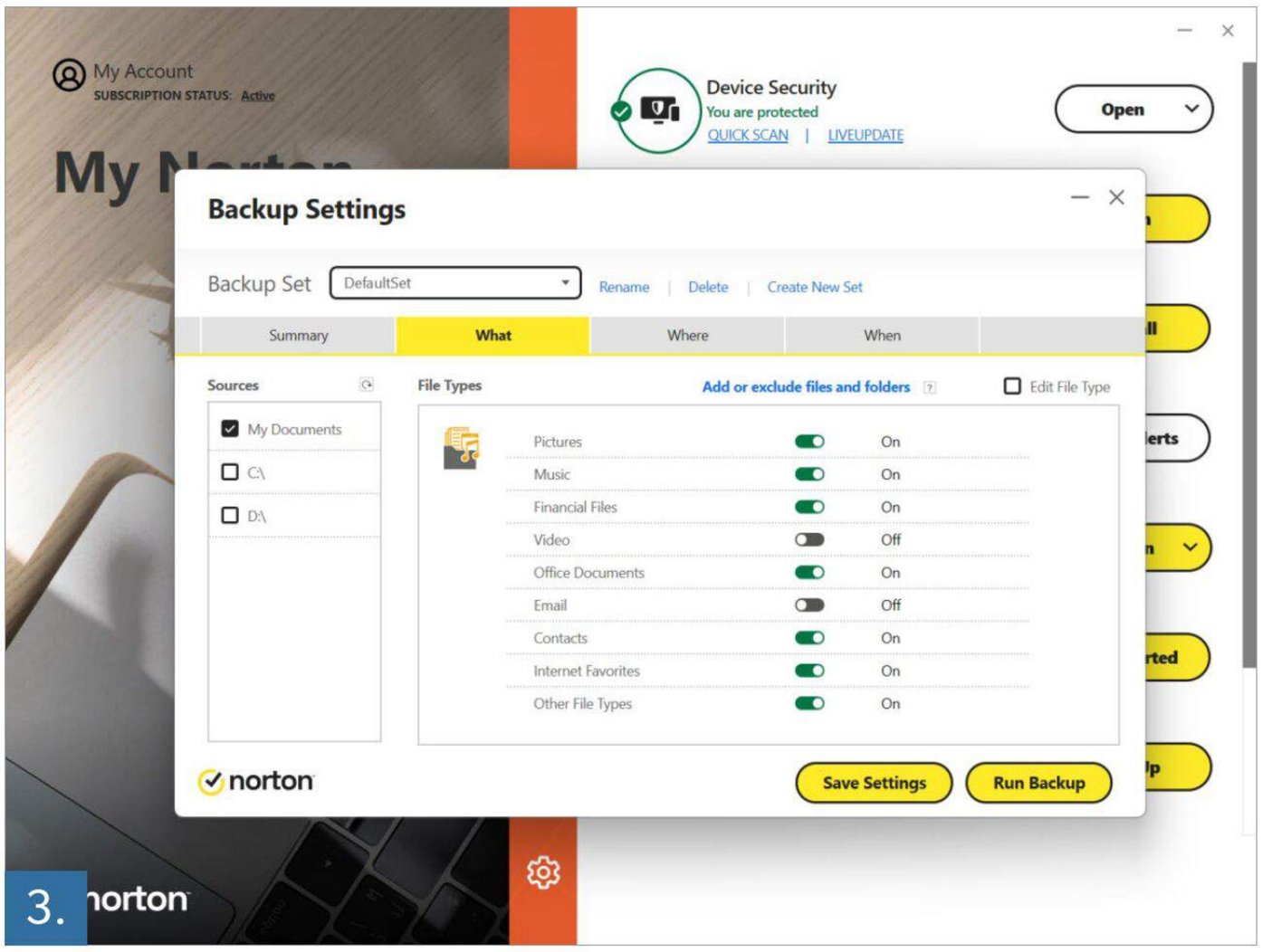
If you're not sure what to configure here, I'd personally recommend activating Auto VPN for protection on more dangerous networks and Kill Switch to ensure nothing can accidentally slip through the VPN when you do decide to use it.

Of course, no matter what you select, you can open up the Norton 360 window and use the Turn On button to connect to the VPN at any time.

3. SET UP CLOUD BACKUPS

Norton 360 offers a built-in cloud backup tool (fave.co/3FWaMk6) that automatically backs up your important files to its online storage so you can access them if you have a computer problem.

If you aren't using cloud backups yet, you probably should. Those online backups can come in handy when malware takes over your PC, your internal storage drive fails, or you misplace your laptop.



Settings to accept. But you could also dig in to see exactly what Norton wants to do.

By default, Norton will back up files like your Pictures and Office Documents, and it will create these backups automatically when you aren't using your computer. Feel free to customize exactly how you want your backups to work.

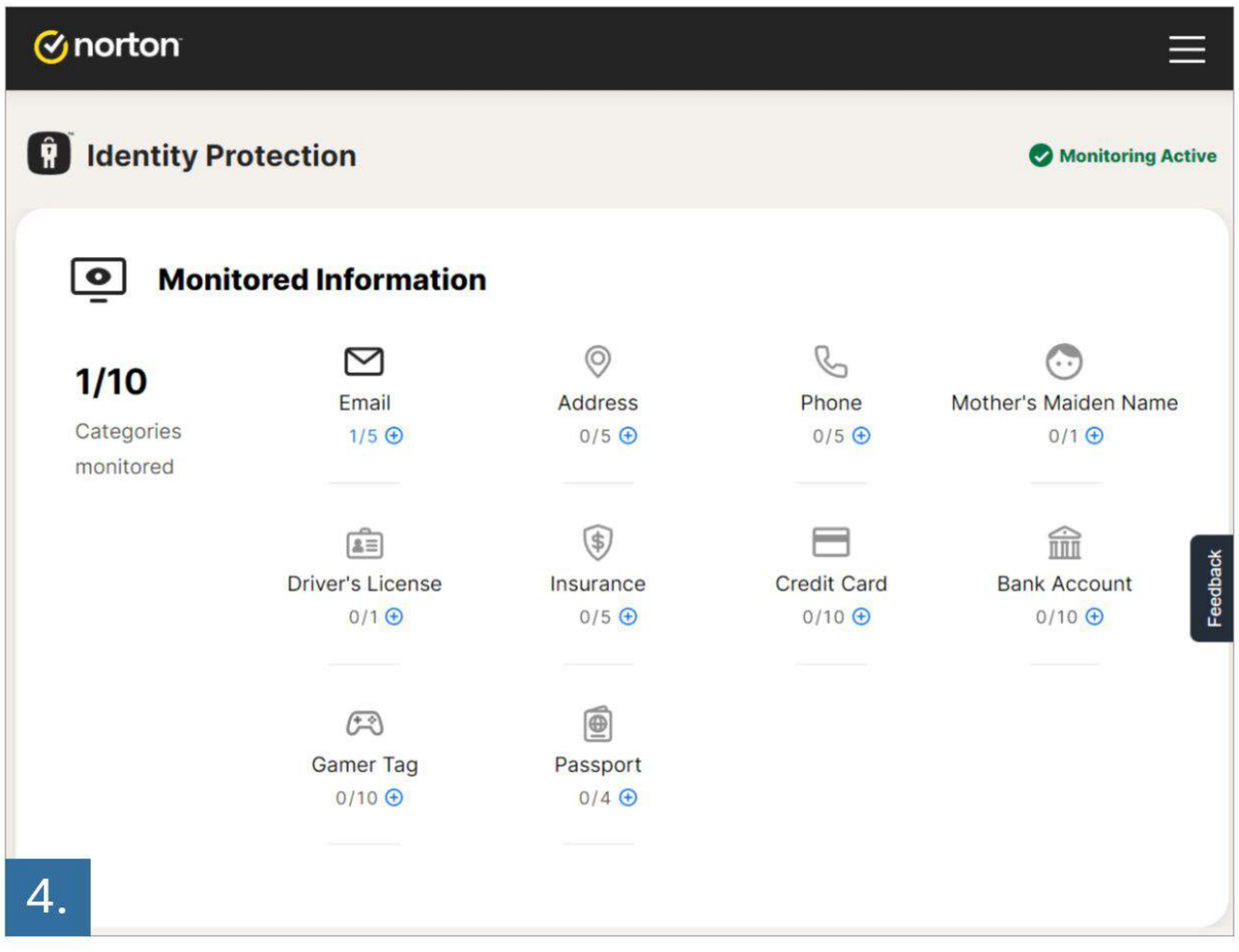
The exact amount of storage you get depends on your Norton 360 plan, but you may have up to 250GB of cloud backup space available. (Some Norton 360 subscriptions offer only 2GB, which can still be plenty for backing up simple but important files.)

To set it up, use the Set Up button to the right of Cloud Backup in the My Norton window. (Norton will also show you how much cloud storage you have available right under Cloud Backup in the window.)

Norton 360 chooses sensible defaults for the backup settings, so you can immediately click Save

4. ADD MORE DETAILS TO DARK WEB MONITORING

Norton 360's features include Dark Web Monitoring, which alerts you whenever your personal information and/or account



credentials appear to be shared on the dark web (fave.co/4f7inh5). To make it truly useful, though, you'll want to add some extra details.

Note: Most versions of Norton 360, including the Deluxe and Standard plans, include Dark Web Monitoring. However, the basic Norton Antivirus Plus plan doesn't include this feature.

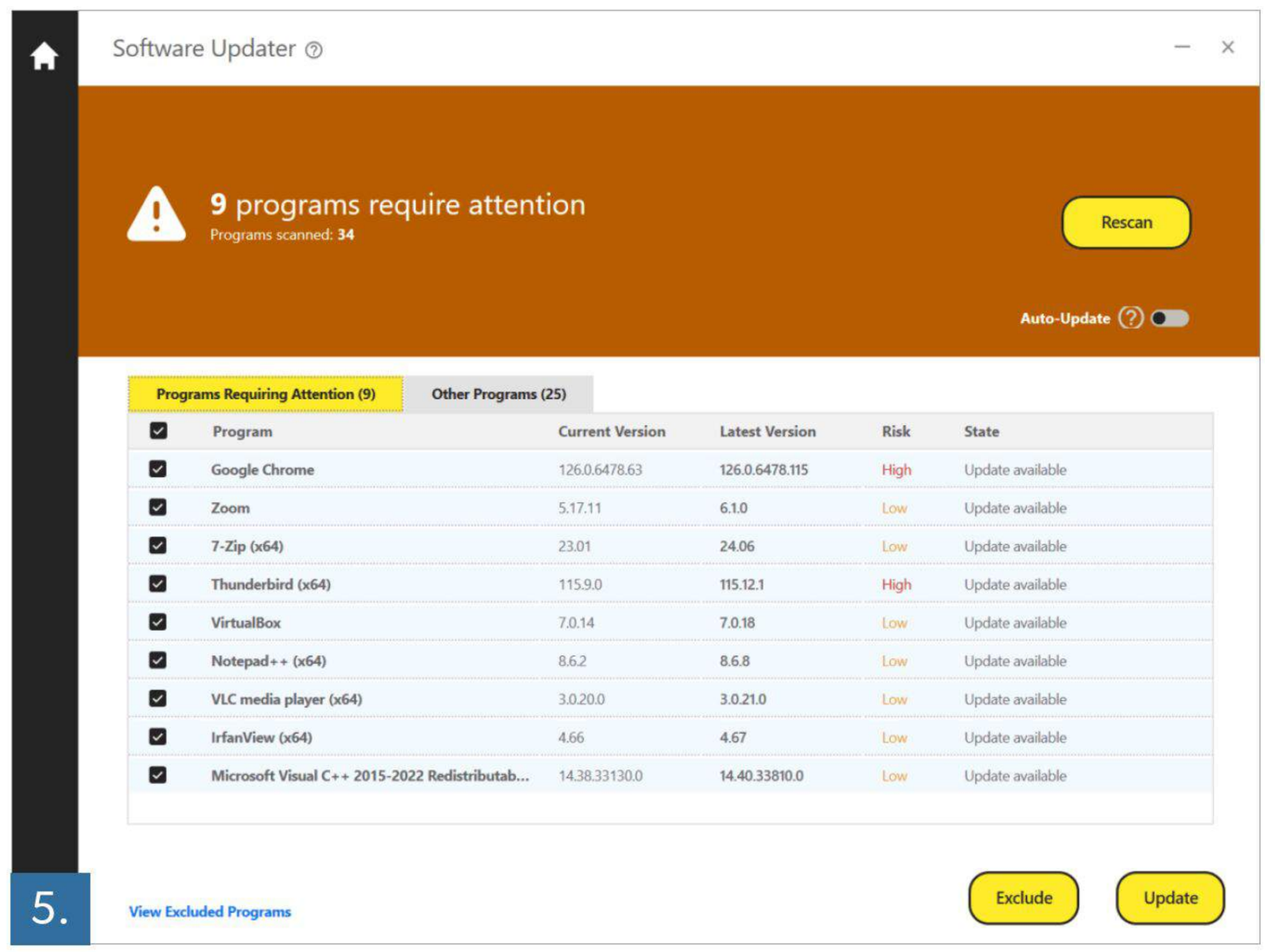
In the My Norton window, activate the Dark Web Monitoring option. Then you'll need to click View Alerts and sign in on the web. Once you've done so, you can add more details to Norton 360's Identity Protection: email addresses, street addresses, phone numbers, driver's license numbers, credit cards, bank account numbers, passport numbers, your mother's maiden name, and even your gamer tag. You'll get a notification if any of these details are found on the dark web. You don't have to add *everything*, but at the very least you should add your most commonly used email addresses. The more details you provide, the more useful Norton's Identity Protection will be.

5. ACTIVATE AUTOMATIC DESKTOP APPLICATION UPDATES

Norton 360 automatically updates itself—no surprise there. But it can also scan your computer for applications that need updates and tell you about them. Better yet: Norton 360 can automatically update those very applications for you in the background.

To scan for desktop application updates, just click the Scan button to the right of Software Updater in the My Norton window. You'll then see any applications that have updates available, and you can click Update to install the updates all at once.

To save time in the future, flip the Auto-Update switch near the top-right corner of the Software Updater pane. Norton 360 will then automatically look for these updates and install them for you in the background.



5.

He's 6'1", but he still looks up to me.

Adopt a teen.
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Tech Spotlight

A video showcase of the latest trends

Watch the video at youtu.be/BVC71534SX4

What if Valve made a Steam Deck for the TV?

The Steam Deck is an amazing handheld gaming PC, but what if you want a similar experience in a console-style box?. Adam and Will talk about what it was like to use the SteamOS-based HololSO on an AMD mini PC and how Valve could do better (if it wanted to).